Ligna-Sweep SKV

KAY ELECTRIC COMPANY

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INSTRUCTION MANUAL

Issue E

February, 1964

LIGNA-SWEEP

Model SKV

Catalog No. 935-B

SWEEPING OSCILLATOR

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SECTION I, FUNCTION AND DESCRIPTION

1.1 INTRODUCTION

The Ligna-Sweep SKV is an audio, video and vhf sweeping oscillator furnishing both linear and logarithmic sweeps. The over-all frequency range is 50 cps to 220 mc, making it a truly versatile, general-purpose sweep generator, useful in the laboratory or on the production-line. Fig. 1.1.

To provide this wide and continuous coverage, the SKV makes maximum use of both fundamental and beat-frequency oscillator techniques. Three beat-frequency bands are provided, each optimized for high stability consistant with the specified sweep width. These circuits are carefully shielded and filtered to prevent spurious output signals and are carefully balanced to preserve pure waveshapes. The beat-frequency system also provides effective frequency coverage permitting continuous displays from 50 cps to 12 mc. Nine overlapping high-frequency bands, operating at fundamental frequencies provide wide, stable sweeps with center frequencies variable between 10 and 220 mc. Direct-reading center-frequency calibration is provided. A panel control provides continuous variation of sweep width.

In addition to the variable center frequency sweep signals, a panel control permits selection of any one of seven narrow, highly stable, fixed sweep bands at frequencies between 20 kc and 12 mc (as specified by the customer). These bands are useful for repetitive alignment of a variety of narrow band tuned circuits, which make them particularly adaptable to production-line testing and alignment.

The SKV generates up to 1 volt rms across approximately 70 ohms. Video, audio, narrow variable, and customer-selected band outputs may be taken from either the RF Out or Audio 600 Ohms terminals, thus providing a selection of output impedances. A blanking circuit turns off the output during CRO retrace time to provide a zero-voltage reference baseline. Fast-acting agc circuits hold these outputs within ±0.5 db over the widest sweep width.

A wide choice of sweep repetition rates are available permitting selection of an optimum rate for each application. A line lock is available for general use, as well as variable rates between 0.2 and 25 cps. The variable rates are useful for investigating high-Q circuits, which sometimes exhibit sharp variations in amplitude response and may not be discernable with a fast fixed rep rate. The manual sweep permits ranging back and forth across any portion of the response of a circuit at any desired rate. This feature is particularly useful when a frequency counter is used to measure the frequency at some point along the response curve, or when it is desirable to retain a permanent record of the response curve by utilizing an X-Y recorder.

A sawtooth signal synchronized with the swept output is made available at the Sweep Out terminals to provide a signal for driving the horizontal amplifiers of a cathode-ray oscilloscope. This provision eliminates the necessity of using the CRO internal sweep, thus dispensing with phasing adjustments.

1.2 FEATURES

The SKV is designed for either bench-top operation or for mounting in a standard 19-inch relay rack and is self-contained, including the voltage-regulated power supply. Although capable of performing a wide variety of functions, operating modes established by the controls are clearly indicated. The illuminated and individually calibrated Band Selector, with hairline and index circle, permits rapid selection of sweep width ranges and high-frequency swept bands. The Sweep Selector and Rate Selector are also illuminated and in conjunction with the Band Selector, provide a clear indication of the operating mode in use.

A limited number of fixed, pulse-type, crystal-controlled frequency markers are available at customer-specified frequencies and made available at terminals on the front panel. This permits the use of a mraker bypass system, wherein frequency markers are supplied directly to the vertical input terminals of the CRO, instead

of being passed through the circuit under test. Frequency markers so provided are independent of the characteristics of the tested circuit. A variable birdie-type marker may be obtained by using a c-w signal generator in conjunction with the SKV on all bands except the audio band and the fixed, customer-selected bands. The schematic diagram in Fig. 1.2 illustrates the circuitry which provides this feature.

Up to 59 db of additive, stepped attenuation, plus 3 db of continuously variable attenuation is provided on all but the audio range. On this range, the amplitude of the swept audio output is variable from 0.5 to 1 volt rms by adjustment of the RF Level control.

The SKV is ruggedly constructed and is designed to provide trouble-free service over long operating periods. The built-in, voltage-regulated power supply is designed for 117 volts operation)or 234 volts operation, requires transformer wiring change).

1.3 SPECIFICATIONS

SWEEP MODE	AUDIO	NARROW VARIABLE	NARROW VIDEO VARIABLE	WIDE VIDEO VARIABLE	VARIABLE	FIXED CUSTOMER SELECTED
CENTER FREQUENCY	50 cps-20 kc	0.01-2 mc	0.01-12 mc	0.01-12 mc	10-220 mc	20 kc-12 mc
NUMBER OF BANDS FOR COVERAGE	1		1	1	9	7
SWEEP WIDTH RANGE	up to 20 kc		up to 1 mc	up to 10 mc	Up to 60% of center frequency to 50 mc; up to 30 mc above 50 mc.	up to 20 kc
	Minimum apparent frequency near zero beat using 10 mc sweep width; 10 kc at 30 cps linear sweep rate; 1 kc in nominally logarithmic sweep operation; 1 kc at 1 cps linear sweep rate.					
OUTPUT LEVEL AND IMPEDANCE	Variable between approx. 0.5 and 1 V rms at 600 ohms	Continuously variable from 1 volt rms down to 62 db below 1 volt at nominal 70 ohms (50 ohms on request). Held constant to ±0.5 db over widest sweep width by agc.				

Frequency Range: 50 cps to 220 mc.

Attenuators (additive): Switchable steps of 3 db, 6 db, 10 db, 20 db, 20 db; variable 3 db.

Sweep Output and Repetition Rates: Sawtooth for horizontal deflection of CRO trace. Low impedance out, approx. 7V p-p.

A. Fixed at 60 cps in line-lock mode.

B. Three continuously variable ranges:
0.2 to 1 cps 1 to 5 cps 5 to 25 cps

C. Manually operated control for varying oscillator frequency.

Power Supply: Input approx. 220W, 117V (±10%), 50 to 60 cps
B+ electronically regulated.

Dimensions: 9¾" x 19½" x 17¼". Suitable for rack mounting.

Optional, Internally Generated Markers: A limited number of sharp, crystal-controlled, pulse-type markers at customer-specified frequencies are available. Amplitude variable from approx. 5 volts peak to zero.

1.4 EQUIPMENT SUPPLIED

The standard SKV is mounted in a metal cabinet and is shipped complete with the built-in power supply. Crystals and diodes for the optional pip circuits are installed only when specifically ordered. Other auxiliary equipment and interconnecting cables referred to in this manual are not furnished.

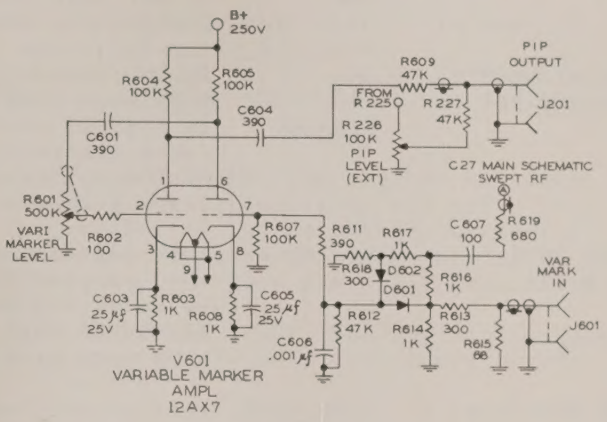


Fig. 1.2 Schematic, Variable Marker Circuit.

SECTION II, INSTALLATION

2.1 GENERAL INSTRUCTIONS

When the SKV is received it should be visually inspected to determine that the instrument was not damaged during shipment. A careful check of packing case contents should be made to insure removal of all items. Shortage or damage should be reported immediately to the Carrier and Kay Electric Company, or its representative in the area.

2.2 INSTALLATION

Installation presents no particular problem since the instrument is designed for either bench-top operation or for mounting in a standard 19-inch relay rack. It is recommended that sufficient space be allotted to avoid obstruction of the ventilating louvers. Space should also be provided for the auxiliary equipment. The operating area should be as free as possible from vibration due to the presence of operating machinery or other vibration sources. Extreme variations of ambient temperature and an environment having excessive humidity should be avoided. Observation of these precautions will result in the user realizing optimum performance of the equipment.

2.3 INTERCONNECTION OF EQUIPMENT

Interconnections between the SKV, the associated equipment, and the circuit to be investigated will be determined, at least partially, by the requirements of the circuit being investigated. The use of coaxial cable is recommended, where indicated, to avoid pick-up of spurious signals. All leads should be kept to minimum length consistent with placement of the equipment. The use of appropriate coaxial connectors at the cable ends will assure a good common ground between the equipment, and proper shielding at the terminations. Further information concerning installation is contained in Section IV.

3.1 EXTERNAL CONTROLS

CONTROL	POSITION	FUNCTION
ON-OFF switch S-11	ON	In ON position, power-line voltage is applied to transformer T-1, energizing the power-supply section; voltage is applied to all filaments and B^+ is applied to the sweep generator circuits.
	OFF	In OFF position, power-line voltage is removed from T-1 and the instrument is de-energized.
STANDBY ON-OFF switch S-12	ON	In ON position, B^+ is applied to balance of circuitry and instrument is ready for operation.
	STANDBY	In STANDBY position, B^+ is removed from all but the sweep generator circuits. In normal application, a horizontal trace will remain on the CRO screen preventing screen burns from occurring.
SWEEP RATE pot R-126	Variable	This pot controls rep rate of the sawtooth voltage appearing at SWEEP OUT terminals, when RATE SELECTOR is in one of the three variable sweep rate positions. The SWEEP RATE control has no effect in either the LINE LOCK or MAN sweep modes.
RATE SELECTOR switch S-1	LINE LOCK VAR 5-25 VAR 1-5 VAR 0.2-1 MAN	This 5-position rotary switch selects the operating mode of the sweep generator circuits. In LINE LOCK position, output is swept at line frequency. In the three variable sweep rate positions, output is swept at a rate determined by setting of RATE SELECTOR and SWEEP RATE controls. In MAN position, the sweep generator circuits are disabled and sweep rate is controlled manually.
SWEEP WIDTH pot R-22	Variable	This potentiometer is used to vary sweep width within limits of the ranges selected by setting of SWEEP SELECTOR and BAND SELECTOR.
BAND SELECTOR switch S-2	12 positions	This multi-position rotary switch is used to select the desired range of sweeps in the video spectrum, or desired high frequency, audio, narrow variable or customer-selected sweep bands.
Center Frequency Control (Inner concentric control of the Band Selector, C-13)	Variable	Inner concentric control of the BAND SELECTOR permits adjustment of center frequency within limits of the selected swept range. The frequency calibration indicates center frequency of the sweep band.
SWEEP SELECTOR switch S-3	10 positions	This rotary switch is used to establish operating mode of rf sweeping oscillator circuits. In any one of seven narrow, fixed, sweep positions, swept rf output is available at customer-selected frequencies. Sweep width is variable up to 20 kc, as determined by setting of SWEEP WIDTH control. The output is available at both AUDIO 600 OHMS terminals and RF OUT jack. In WIDE VAR & VIDEO position, BAND SELECTOR is effective and swept rf output is available at any center frequency from 10 kc to 220 mc. In AUDIO position, a swept audio signal is available at both AUDIO 600 OHMS terminal and RF OUT jack. The audio signal is swept from 50 cps to 20 kc. In NAR VAR position, a swept signal up to 20 kc wide, with center frequency variable between 10 kc and 2 mc, is made available at both AUDIO 600 OHMS terminal and RF OUT jack.

CONTROL	POSITION	FUNCTION
NAR & AUDIO CENTERING	Variable	This potentiometer is used to set the location of band segment being observed in the narrow sweep bands, when SWEEP WIDTH control is set for less than maximum sweep width. At maximum narrow sweep width of 20 kc, NAR & AUDIO CENTERING control is used to locate band center-frequency in middle of CRO trace. This control is also used to set the zero beat of the swept audio output at left end of trace.
AGC - OFF switch S-5	AGC	In AGC position, automatic gain control is applied to swept rf appearing at RF OUT jack.
	OFF	The AGC-OFF switch should be set to OFF to disable the agc circuit when SWEEP SELECTOR is set for AUDIO operation.
LOG SWEEP-LINEAR SWEEP switch S-4	LOG SWEEP	When S-4 is set to LOG SWEEP, the regular sawtooth signal used to vary the frequency of the sweep oscillators, is transformed in the cathode circuit of V-3B to a logarithmic voltage change, causing the oscillator in use to undergo a nominally logarithmic change in output frequency.
	LINEAR SWEEP	When S-4 is set to LINEAR SWEEP, the regular sawtooth voltage is used to linearly vary oscillator output frequency.
MANUAL SWEEP pot R-137	Variable	This control is used to manually vary oscillator frequency when RATE SELECTOR is set to MAN. In this mode of operation, oscillator output is a c-w signal which can be manually swept, or held at any frequency within the normal swept ranges.
Attenuator switches S-6 thru S-10	Stepped	These toggle switches permit insertion of additive, stepped attenuation of 3 db, 6 db, 10 db, 20 db, and 20 db ahead of the RF OUT jack.
RF LEVEL pot R-164	Variable	This control provides a 3-db variable increment of attenuation in addition to the stepped attenuation. (With agc off the variable increment is 6 db.)
PIP ADJ pot R-218	Variable	This control is used to establish the firing point of Schmitt trigger V-202. Proper setting for this control is a point midway between the setting at which one or more marker pips disappear and the setting at which multiple or spurious pips appear.
PIP LEVEL pot R-226	Variable	The amplitude of marker pips appearing on the CRO can be varied from zero to 5 volts, according to the setting of this control.
VAR MARK LEVEL pot R-601	Variable	The amplitude of the birdie-type variable marker may be varied with this control.

3.2 INTERNAL CONTROLS

CONTROL	POSITION	FUNCTION
60 Cycles ADJ pot R-129	Variable	This potentiometer, located on the left side chassis bracket, is used to set sweep generator line lock operation when SWEEP SELECTOR is set to LINE LOCK.
SYNC LOCK pot R-9	Variable	Located on left side chassis bracket and is used in conjunction with 60 Cycle ADJ control (R-129) to synchronize sync generator V-1 to power-line frequency.

CONTROL	POSITION	FUNCTION
AGC MIN & AGC MAX pots R-167 & R-166	Variable	These two controls are located on right side chassis bracket and are adjusted so that rf output varies 3 db as RF LEVEL control is adjusted through its range.
AUDIO LEVEL pot R-163	Variable	This control, located on the right side chassis bracket, is used to establish audio output at 1 volt rms maximum when agc circuits are disabled (S-5 in OFF position and SWEEP SELECTOR in AUDIO position).
PIP ADJ pot R-216	Variable	Located on left side chassis bracket and used to establish range of PIP ADJ control R-218 (located on the front panel).
PIP GEN ADJ pot R-224	Variable	Located on left side chassis bracket and used to establish the point at which pip multivibrator V-203 fires.
YOKE CURRENT ADJ pot R-70	Variable	Located on left side chassis bracket and controls shape of sweep signal as it passes through sawtooth amplifier V-7. (See Section 6.4C.)
MODULATOR BALANCE pot R-200	Variable	Located on low-pass filter shield bracket and used to balance modulator.

3.3 TERMINALS

TERMINAL	FUNCTION
SWEEP OUT terminal J-1	A sawtooth voltage, synchronized with the sweeping output, is available at this terminal and is normally used as a horizontal deflection voltage for the CRO. At slow sweep rates and manual sweep, the CRO should be switched to d-c amplifier operation.
MARKER RF OUT jack J-2	Swept rf output, at same frequency as that at RF OUT jack, is available for use by Vari-Marker SKV* in developing additional frequency markers.
AUDIO 600 OHMS terminal J-3	Swept audio output covering frequency range of 50 cps to 20 kc is available at this terminal at an impedance of 600 ohms. The output from the video, narrow variable, and customer-selected bands is available at this terminal. When output is taken from AUDIO 600 OHMS terminal, RF OUT jack should be left open and all attenuation should be out in order to preserve proper waveshapes.
RF OUT jack J-4	All sweeps are available at this BNC-type jack. According to setting of attenuator and RF LEVEL control, output may be varied up to 1 volt into 70 ohms (50 ohms if specified).
PIP OUT terminal J-201	Fixed, crystal-controlled, frequency identifying pulses, are available at this terminal.
VAR MARK IN jack J-601	When a variable birdie-type marker is desired, output of a c-w signal generator must be fed into this jack.

*Auxiliary equipment.

4.1 INTRODUCTION

The SKV is designed as a general utility sweep generator, useful for sweeping circuits having pass-bands from 50 cps to 220 mc. When used with a CRO, the response curve of the circuit being investigated is displayed on the face of the cathode-ray tube. Because the sawtooth voltage available from the SKV is synchronized with the swept rf output, it can be used to drive the X-axis amplifiers in the CRO, thus avoiding any nonlinearity originating in the CRO sweep circuits.

During CRO retrace time there is no rf output from the SKV, due to the action of the blanking circuits. This permits the development of a zero-voltage baseline, which may be used as a reference during amplitude measurements.

Considering the wide range of frequencies covered by the instrument and the variety of sweep modes, operation is not complicated. This is particularly so when operating on any of the customer-specified bands.

4.2 GENERAL OPERATING PROCEDURE.

Since there are several types of swept outputs available, linear operation on one of the wide variable bands only will be discussed here. Operating procedures for other modes will be discussed later.

If maximum utility is to be obtained from this instrument, deviations from this procedure will be necessary, according to the measurements being made and the type of equipment being investigated. Basic interconnections for using the SKV are shown in Fig. 4.1. (See Section 2.2 for general information concerning interconnections.)

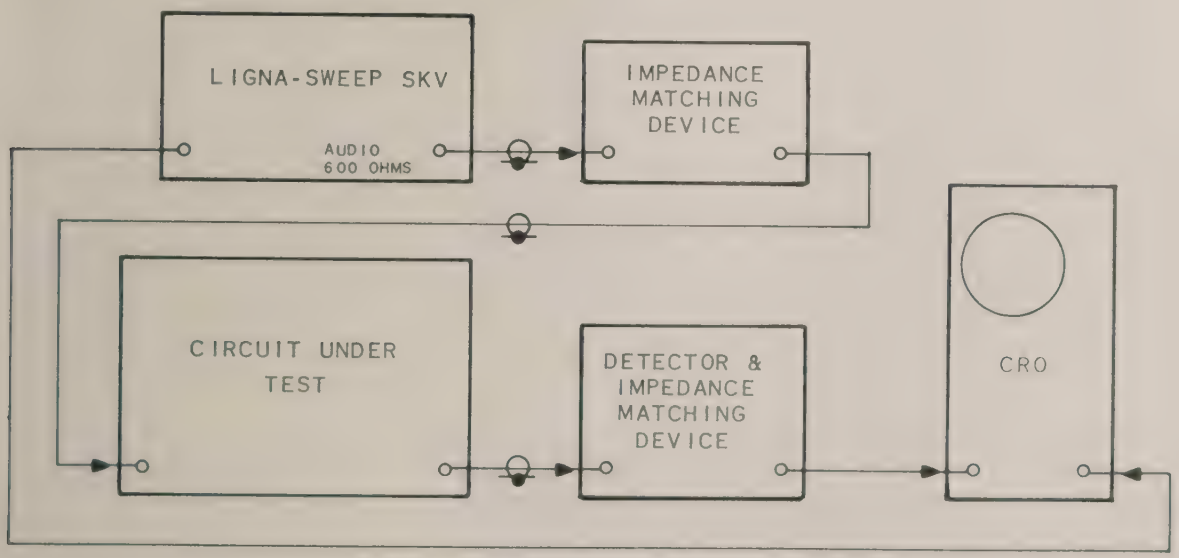


Fig. 4.1 - Basic Interconnection of Equipment. For use on the audio band, swept output is taken from the Audio 600 Ohms jack and the detector shown is not required.

Step 1. Interconnect the equipment as shown in Fig. 4.1.

Step 2. Set ON-OFF switch to ON and allow about 15 minutes for the circuits to stabilize.

Step 3. Set the STANDBY switch to ON.

Step 4. Set the AGC-OFF switch to AGC.

Step 5. Set LOG SWEEP-LINEAR SWEEP switch to LINEAR SWEEP.

Step 6. Set RATE SELECTOR to LINE LOCK.

Step 7. Set SWEEP SELECTOR to WIDE VAR & VIDEO.

Step 8. Set BAND SELECTOR to the frequency band which includes the pass-band of the circuit under test.

Step 9. Set Center Frequency control (inner concentric knob of Band Selector switch) to center frequency of the pass-band of circuit being tested.

Step 10. Set SWEEP WIDTH control to that position which gives a sweep width approximately three times the width of pass-band of circuit being tested.

Step 11. Set RF LEVEL control and attenuator switches for an output compatible with input requirements of circuit being tested, for easy viewing on the CRO.

4.3 CUSTOMER SELECTED BANDS

Seven fixed-frequency bands are available, and center frequencies are usually specified (by the customer) within the range of 20 kc and 12 mc. The simplicity of operation of these bands makes it practicle to use them for production-line testing.

To operate on these bands, connect equipment as shown in Fig. 4.1. The Sweep Selector should be set to the desired band and Band Selector set to Nar Var & Audio position (Center Frequency control is inoperative). The output may be taken from either the RF Out jack (70 ohms impedance) or the Audio terminals (600 ohms impedance). The remainder of the procedure is the same as that outlined in Section 4.2. Note:- When the output is being taken from the Audio 600 Ohms terminal, the RF Out jack should be left disconnected and all attenuation should be out in order to preserve proper waveshapes.

4.4 NARROW VARIABLE BAND

Center frequency of the narrow variable band is variable between 10 kc and 2 mc, with a sweep width variable up to 20 kc. This is useful for investigating circuits in the audio and low r-f ranges. To use this band, the Sweep Selector switch must be set to Nar Var and Band Selector set to Nar Var & Audio. The Nar & Audio Centering control should be set to the center of its range. Output may be taken from either the Audio 600 Ohms terminal or from the RF Out jack. Otherwise the operating procedure is the same as that outlined in Section 4.2. Note:- When the output is being taken from the Audio 600 Ohms terminal, the RF Out jack should be left disconnected and all attenuation should be out in order to preserve proper waveshapes.

4.5 AUDIO BAND

Center frequency is variable between 50 cps and 20 kc on this band, and output may be taken from either the Audio 600 Ohms terminal or the RF Out jack. The Sweep Selector switch must be set to Audio and the Band Selector switch set to Nar Var & Audio. The AGC switch should be set to Off. The Nar & Audio Centering control is used to vary the center frequency of the sweep when the audio band is in operation. Otherwise the operating procedure is the same as that outlined in Section 4.2. Note:- When the output is being taken from the Audio 600 Ohms terminal, the RF Out jack should be left open and all attenuation should be out in order to preserve proper waveshapes.

4.6 VARIABLE REPETITION RATES

Variable repetition rates between 0.2 and 25 cps are provided in three ranges. These rates are made available by turning the Rate Selector to one of the three variable repetition rate ranges. The Sweep Rate control is then adjusted until the de-

sired repetition rate, within the range determined by the setting of the Rate Selector, is produced. The rate selected should be fast enough to retain as much of the pattern as possible while still maintaining the correct response curve. A long persistent cathode-ray tube in the CRO is desirable for proper pattern retention when using slow sweep rates.

A variable repetition rate is useful when observing circuits having sharp variations in amplitude response. In such cases, a slow repetition rate is more likely to disclose these variations. Another advantage of the variable repetition rate becomes apparent when a circuit exhibiting 60-cps hum is being examined. When swept at a 60-cps rate, or at a rate which is a harmonic of 60 cps, a distorted response curve is produced. If the repetition rate is changed to a rate other than 60 cps, or one of its harmonics, the response curve will exhibit oscillation. In this way the variable repetition rate may be used to detect the presence of hum in a circuit.

4.7 MANUAL SWEEP

Manual control is available for both linear and logarithmic sweeps. Manual control is obtained by setting the Rate Selector to Man position. Output frequency of the SKV is now varied either side of the frequency determined by the setting of the Center Frequency control by adjusting the Manual Sweep control. Frequency range of the Manual Sweep control depends upon the customer-selected band in use; the center frequency cannot be changed, and the frequency is determined only by the setting of the Manual Sweep control and the Sweep Width control.

This feature permits ranging back and forth across any portion of the response curve of a circuit at a repetition rate determined only by the speed at which the Manual Sweep control is rotated. If the operator wishes to determine the exact frequency of a particular point on the response curve, he may vary the Manual Sweep control until that point is reached. He may then read the frequency directly on a frequency counter. The sweep rate may be kept slow enough, by using the manual sweep, to facilitate the use of an X-Y recorder, thus obtaining a permanent record of the response of the circuit.

4.8 LOGARITHMIC SWEEP

The logarithmic sweep may be used with all of the various types of sweeps and sweep rates by setting the Linear Sweep - Log Sweep switch to Log Sweep position. The lower end of the sweep is expanded, while the upper end is contracted, giving the advantage of a narrow sweep at the lower end, while still displaying the complete pass-band of the circuit under test. This feature is useful when examining the low-frequency end of audio and video circuits where the response may tend to "roll off" or rise. The Sweep Width control should be set fully clockwise for best results.

4.9 ATTENUATOR

The stepped attenuator is useful for measuring voltage levels. A reference can be established on the CRO for voltage levels above or below the average signal level in terms of db, without the necessity of external measuring devices. Such useful information as "3 db down" points can be obtained directly. A 3 db variable attenuation control (6 db when the AGC switch is in Off position) is also provided.

4.10 MARKERS

Provision is made for a limited number of crystal-controlled, pulse-type markers, which are provided as ordered. Since the Pip Out terminal is usually connected to the vertical input terminal of the CRO, the markers do not affect the response of the tested circuit. When a response curve with frequency markers is desired, set the Band Selector to the range on which markers are expected to appear. The Pip Level control should be set to approximate center of its range. The Pip Adj control may then be adjusted until a single, sharp, stable pip appears for each crystal frequency. The Pip Level control then is adjusted to provide convenient marker amplitude.

A variable birdie-type marker may be obtained by applying the output of a c-w signal generator to the Var Mark In jack. The signal generator must have a frequency output corresponding to the range over which a variable marker is desired and an output of at least fifty microvolts rms. If the output impedance of the generator differs substantially from 70 ohms, an impedance matching device is necessary. The variable marker signal is available at the Pip Out jack and marker amplitude is adjusted with the Var Mark Level control.

SECTION V, CIRCUIT DESCRIPTION

5.1 INTRODUCTION

This section is devoted to a general discussion of Ligna-Sweep SKV circuits. While a working knowledge of the circuitry is not essential to operate the instrument, such knowledge is useful to the service technician and to the discriminating user desiring to exploit the instrument's versatility to the fullest extent.

5.2 OVER-ALL CIRCUIT ANALYSIS

Sync generator V-1 generates a train of square waves at a 60-cps rate when the Rate Selector is set to Line Lock. Fig. 5.1. These square waves are used to trigger sweep generator V-2. When the Rate Selector is set to one of the variable repetition rate positions, the sweep generator is no longer triggered by the signal from the sync generator and operates at a frequency determined by the setting of the Sweep Rate control.

There are two outputs from the sweep generator. One of these is a negative pulse used to operate a blanking circuit which serves to turn off sweeping oscillators V-5 and V-6, fixed buffer-amplifier V-10, and sweep buffer-amplifier V-11 during CRO retrace time. This provides a zero-voltage reference baseline. The other output is a square wave which is fed through a shaping circuit to change it into a sawtooth wave, which is then applied to cathode follower V-3A. Output of the cathode follower is a low-impedance sawtooth used to drive the vertical amplifiers of the CRO. A second output from this cathode follower is fed to a second cathode follower (V-3B) where the amplitude of the sawtooth signal is regulated. Amplitude of the sawtooth is also affected by the setting of the Sweep Width control.

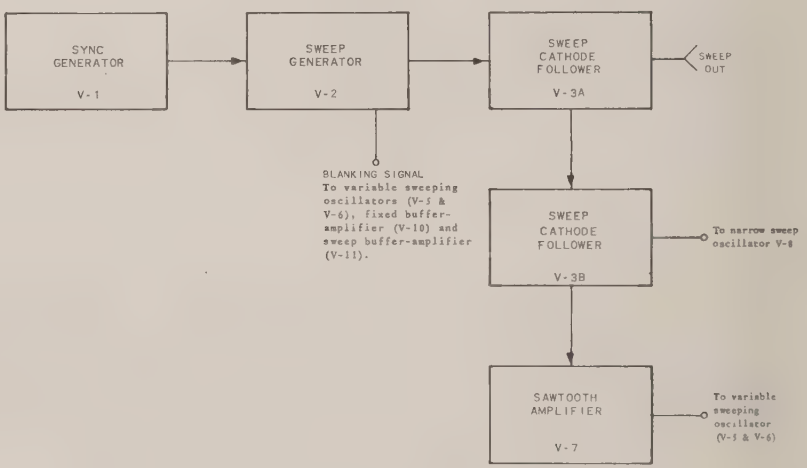


Fig. 5.1, Simplified Block Diagram, Sweep Generating Circuits.

If the Sweep Selector is set to Wide Var & Video position, the sawtooth output of cathode follower V-3B is fed through sawtooth amplifier V-7, where it is amplified prior to being used to control the instantaneous frequency of variable sweeping oscillators V-5 and 6. For any other position of the Sweep Selector, output from the cathode follower is fed to narrow sweep oscillator V-8.

The logarithmic sweep, selected by setting S-4 to Log Sweep, routes the sawtooth output of the cathode follower through a shaping network (D-3 through D-5) which transforms the linear sawtooth voltage into an essentially logarithmic voltage. This logarithmic voltage is then fed to sawtooth amplifier V-7 and to narrow sweep oscillator V-8.

When the Rate Selector is set to Man position, both sync generator V-1 and sweep generator V-2 are disabled. Due to the d-c coupling employed, any change in the setting of the Manual Sweep control (R-137) changes the inductance of the sweeping oscillator tank (L-1B thru L-12B). The oscillator (V-5, V-6) then operates as a c-w generator at a frequency determined by the instantaneous inductance of the tank coil, and by the setting of the Band Selector and Center Frequency controls.

B. High Frequency Sweeps.

When the Band Selector is set to one of the nine r-f bands and the Sweep Selector is set to the Wide Var & Video position, the circuit configuration is as shown in Fig. 5.2. Frequency of the variable sweeping oscillator is controlled by the signal appearing at the output of sawtooth amplifier V-7. The swept frequency output is fed to the attenuator and agc detector, and the output is made available at the RF Out jack. A sample of the rf output is applied to agc detector D-14. The resultant rectified correction voltage is then amplified by V-12, V-13 and applied to the variable sweeping oscillators in such a way that the amplitude of the rf output is held constant over the frequency range of the instrument.

C. Video Sweep.

When the Band Selector is set to either Wide Video or Nar Video position, and Sweep Selector set to Wide Var & Video position, the circuit configuration is as shown in Fig. 5.3. The swept r-f output of the variable sweeping oscillators is fed through buffer-amplifier V-11 and to balanced modulator D-9 thru D-12 where it is mixed with a 30-mc c-w signal coming from fixed oscillator V-9 and fixed buffer-amplifier V-10. These two signals are mixed within the modulator and the output is fed through a low-pass filter which passes only the difference frequencies. These difference frequencies are then amplified by video amplifier V-15 and passed through cathode follower V-16 and then to the Audio 600 Ohms terminal. A portion of the output from V-16 is fed through the attenuator and agc detector and made available at RF Out jack J-4. This output signal is sampled by the agc detector and a correction signal is developed to control the output of fixed buffer-amplifier V-10.

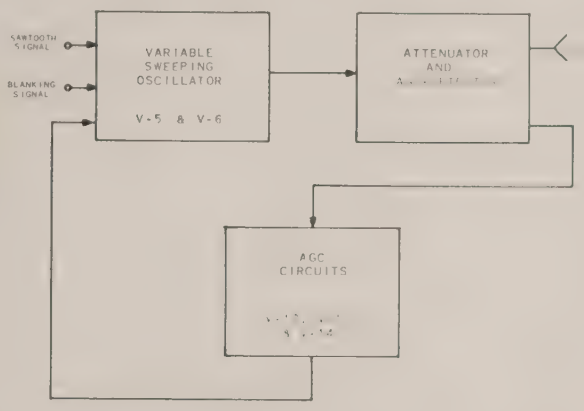


Fig. 5.2 - Simplified Block Diagram, High-frequency Sweep Circuits.

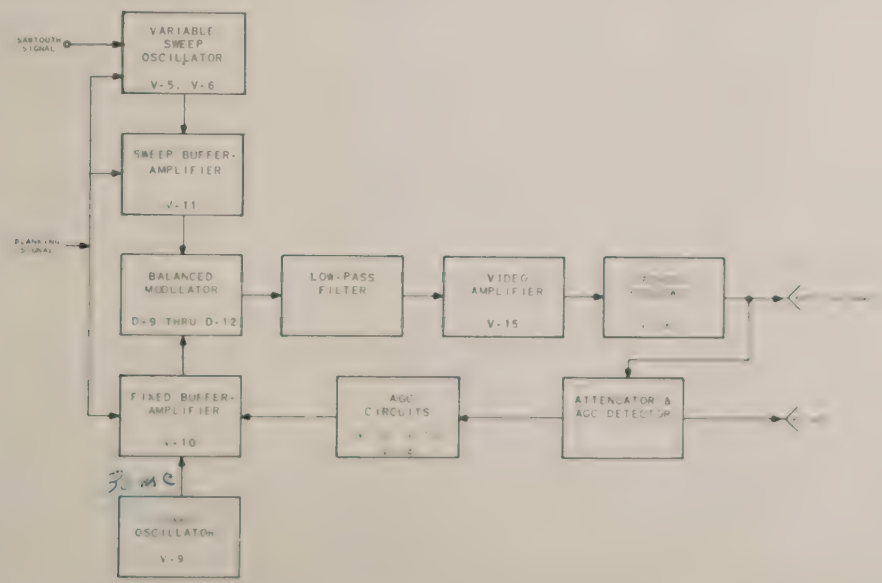


Fig. 5.3, Block Diagram, Video Sweep Operation.

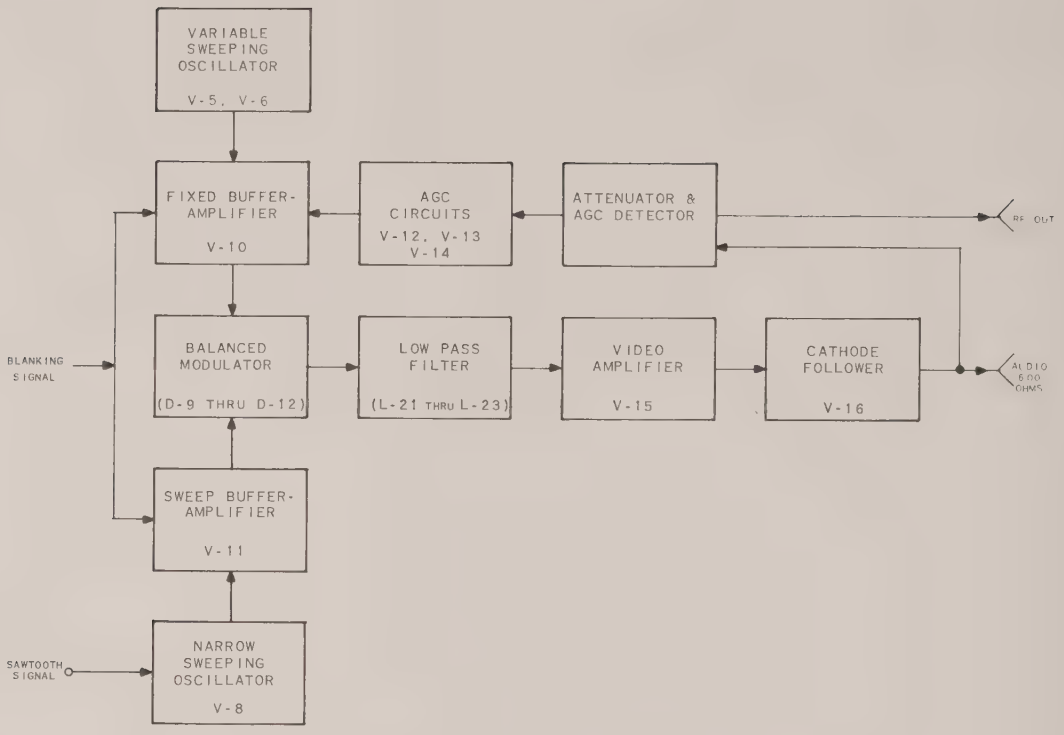


Fig. 5.4, Block Diagram, Narrow Variable Sweep Operation.

D. Narrow Variable Sweep.

When the Band Selector is set to Nar Var and Sweep Selector set to Nar Var & Audio position, circuit configuration is as shown in Fig. 5.4. In this mode of operation, variable oscillator V-5, V-6 is not swept and, therefore, operates as a tunable c-w oscillator. Output from the variable oscillator is fed through buffer-amplifier V-11 and to the balanced modulator. The second input signal to the modulator is from V-8, the narrow sweep oscillator. This signal is passed through buffer-amplifier V-10 to the modulator. Again, both sum and difference frequencies are generated, but only the difference frequencies pass through low-pass filter L-21 thru L-23 to video amplifier V-15.

E. Audio Sweep.

When the Band Selector is set to Nar Var & Audio position and the sweep Selector set to Audio position, circuit configuration is as shown in Fig. 5.5 The sawtooth signal from V-3B is used to vary the frequency of narrow sweep oscillator V-8, the output of which is fed through buffer-amplifier V-11 to the modulator where it is mixed with a 39.99 mc c-w signal coming from fixed crystal oscillator V-9 and fixed buffer-amplifier V-10. The difference frequency of these two signals is passed through a low-pass filter and through video amplifier V-15 and cathode follower V-16. The audio output is available at the Audio 600 ohms terminal.

F. Customer Selected Sweeps.

When the Band Selector is set to Nar Var & Audio position and Sweep Selector set to one of the customer-selected bands, the circuit configuration is as shown in Fig. 5.6. Circuit analysis is similar to that described for Audio band operation, the only difference being that the signal appearing at the Audio 600 Ohms terminal is also fed to the agc detector and attenuator, and appears at the RF Out jack at an output impedance of 70 ohms. The output is also sampled by the agc detector and a correction voltage is generated within the agc circuits (V-12 thru V-14) which is applied to fixed buffer-amplifier V-10 to maintain the output at a constant amplitude.

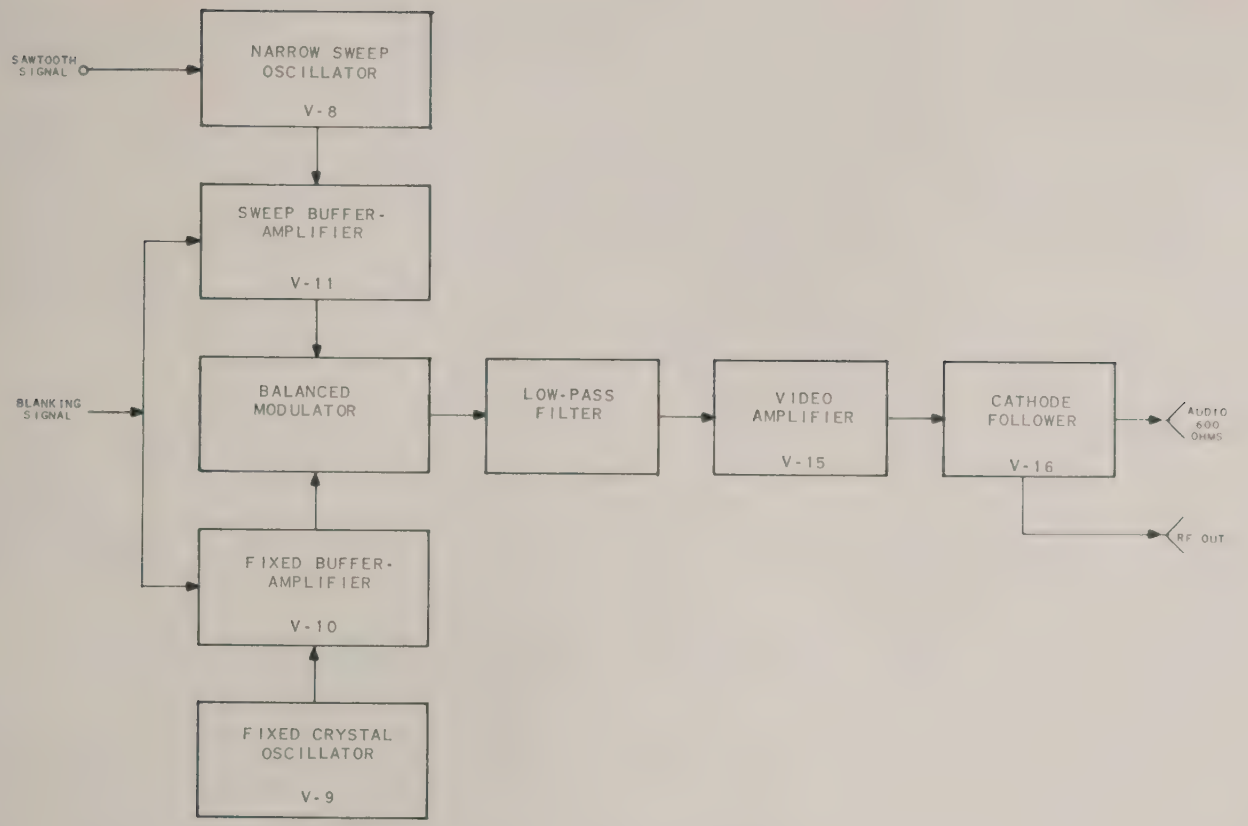


Fig. 5.5, Block Diagram, Audio Sweep Operation.

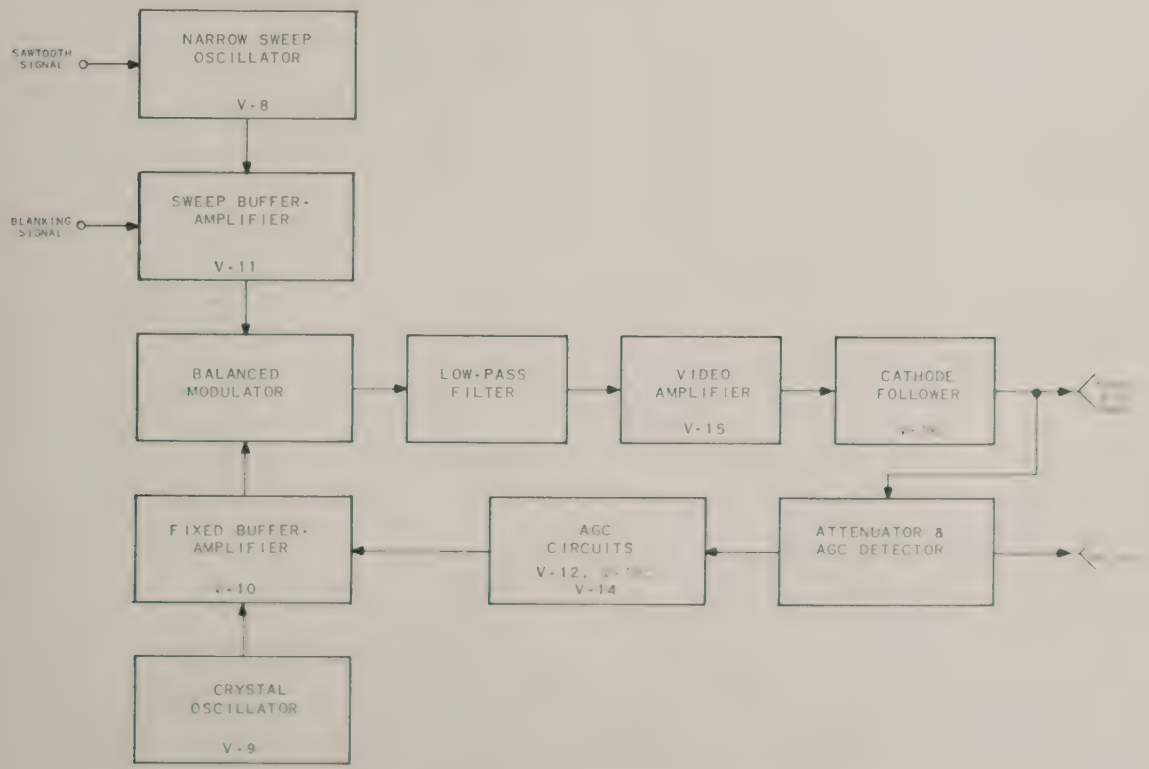


Fig. 5.6, Block Diagram, Customer-Selected Sweep Range Operation.

6.1 INTRODUCTION

This section covers recommended procedures for trouble shooting, alignment, and inspection. An inspection procedure for quickly inspecting the equipment for incoming inspection or for periodic maintenance inspections is included.

6.2 MAINTENANCE SUGGESTIONS

The use of a cathode-ray oscilloscope is recommended for signal tracing the circuitry to locate circuit malfunctions. A detector probe is required when signal tracing in the r-f circuits. A schematic for a suitable detector is shown in Fig. 6.1.

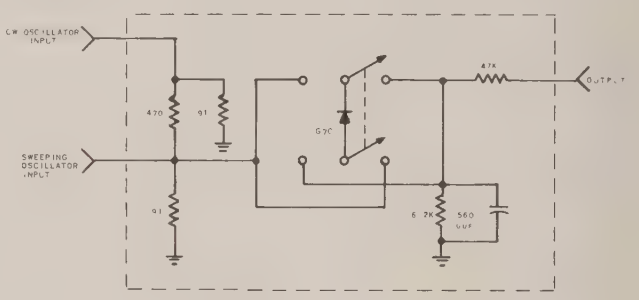


Fig. 6.1, R-F Detector Schematic. Resistors are 1/2 watt.

6.3 INSPECTION PROCEDURE

Equipment Required

Cathode-ray oscilloscope (Tektronix Type 503 or equivalent).
C-W Signal Generator (Kay Electric Utilator, or equivalent).
Detector (Fig. 6.1).
Wave Traps tuned to 200, 2000, 10,000 and 20,000 cps.
C-W Signal Generator (Tektronix Type 190, or equivalent).
Wide-band R-F Voltmeter (Hewlett-Packard Type 400D, or equivalent)

This portion of the inspection procedure may be completed without removing the instrument from its cabinet. The steps outlined here may be used to ascertain that the unit meets specifications and may also be used for a periodic check-out of the circuitry.

A. Repetition Rates.

Line Lock

Step 1. Provide a connection between the Sweep Out terminal and the vertical input terminal on the CRO (CRO controls should be set for d-c operation).

Step 2. Set Rate Selector to Line Lock.

Step 3. Set CRO controls as follows:
Horizontal display: Normal (internal sweep).
Trigger selector: Auto, + INT.
Variable time/div: Calibrated, 5 milliseconds.

Step 4. See that the CRO pattern remains locked at 16 milliseconds while rotating the Sweep Rate control through its range.

Variable Repetition Rates

Step 1. Provide a connection between the Sweep Out terminal and the vertical input terminal of the CRO (CRO should be set for d-c operation).

Step 2. Set Rate Selector to Var 5-25.

Step 3. Set Sweep Rate control fully clockwise.

Step 4. Sawtooth duration time, as viewed on the CRO, should be less than 40 ms.

Step 5. Set Sweep Rate control fully counterclockwise.

Step 6. Re-set the variable time/division switch on the CRO so that the sawtooth duration time can be measured (0.1 seconds).

Step 7. See that the sweep rate is less than 5 cps (sawtooth duration time should be greater than 0.2 seconds).

Step 8. Repeat steps 2 through 7 with Rate Selector set to Var 1-5. Repeat again with Rate Selector set to Var 0.2-1. Sweep duration times should be as follows: 5 cps (=0.2 seconds); 1 cps (=1.0 seconds); 0.2 cps (=5.0 seconds).

Sawtooth Output Voltage

Step 1. Set Rate Selector to Line Lock.

Step 2. Set CRO to 5 ms/division.

Step 3. See that amplitude of straight portion of sawtooth is 12 volts. Fig. 6.2 illustrates the waveform which should be obtained on the CRO during this test.

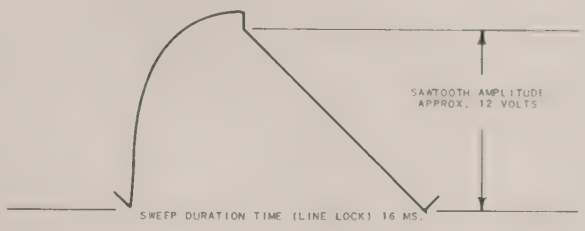


Fig. 6.2, Waveform, Sweep Output

B. Frequency and Sweep Width of RF Bands.

Step 1. Interconnect equipment as shown in Fig. 6.3.

Step 2. Set panel controls as follows:

Sweep Selector: Wide Var & Video
Rate Selector: Line Lock
RF Level: maximum clockwise
AGC: On
Sweep Width: maximum clockwise
Log Sweep - Linear Sweep: Linear Sweep
Attenuation: All out

Step 3. Set Band Selector to 150 to 220-mc band.

Step 4. Adjust Center Frequency control until dial indicates the lowest reading on the band.

Step 5. Set signal generator to the reading shown on the SKV dial.

Step 6. Turn Sweep Width control fully counterclockwise.

Step 7. See that the birdie produced by the signal generator appears on the CRO.

Step 8. Set the Sweep Width control fully clockwise.

Step 9. Vary output frequency of signal generator to place birdie marker at extreme left-hand side of trace. Record frequency reading of the signal generator.

Step 10. Tune the signal generator until the birdie marker appears at extreme right-hand side of the CRO trace. Record output frequency of signal generator. The difference between these two frequencies equals the sweep width of SKV at that point. At center frequencies above 50 mc, the sweep width should be at least 30 mc. At center

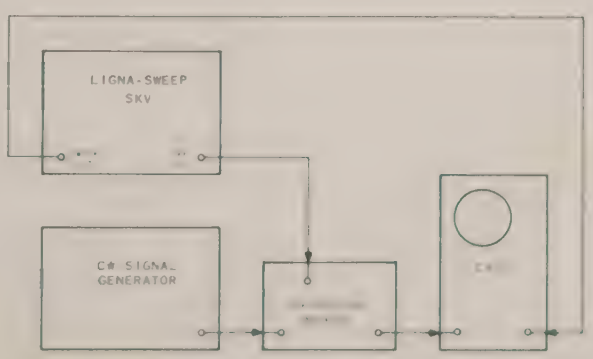


Fig. 6.3, Interconnection of Equipment for Checking RF Bands.

frequencies below 50 mc, the sweep width should be 60% of the center frequency at the lowest specified frequency end of the band.

Step 11. Repeat this procedure for all other r-f bands.

C. Frequency and Sweep Width of Video Bands.

Step 1. Interconnect equipment as shown in Fig. 6.3

Step 2. Set panel controls as follows:

Sweep Selector: Wide Var & Video
Band Selector: Wide Video
Center Frequency: Fully clockwise
Log Sweep - Linear Sweep: Linear Sweep
Rate Selector: Line Lock
RF Level: Maximum clockwise
AGC: On
Sweep Width: Maximum clockwise
Attenuation: All out

Step 3. See that the zero beat appears in approximate center of trace.

Step 4. Tune Center Frequency control to move zero beat to extreme left-hand side of trace.

Step 5. Set signal generator at 15 mc.

Step 6. See that output of SKV cuts off at 15 mc.

Step 7. Reverse detector to compare negative and positive outputs. If both outputs correspond in amplitude and shape, the outputs are balanced.

Step 8. Set Band Selector to Nar Video position and check this band in a similar manner.

D. Frequency and Sweep Width of Audio Bands.

Step 1. Interconnect equipment as shown in Fig. 6.5.

Step 2. Set panel controls as follows:

Rate Selector: Line Lock
Sweep Selector: Audio
Band Selector: Nar Var & Audio
Sweep Width: Maximum clockwise
RF Level: Maximum clockwise
AGC: Off
Attenuation: All out
Log Sweep - Linear Sweep:
Linear Sweep

Step 3. See that the mark caused by 20-kc trap is visible at left-hand side of trace, when zero beat is set to extreme right-hand side by adjusting Narrow and Audio Centering control.

Step 4. See that Nar & Audio Centering control has sufficient range to allow observation of both zero beat and 20-kc mark when Sweep Width control is set fully counterclockwise.

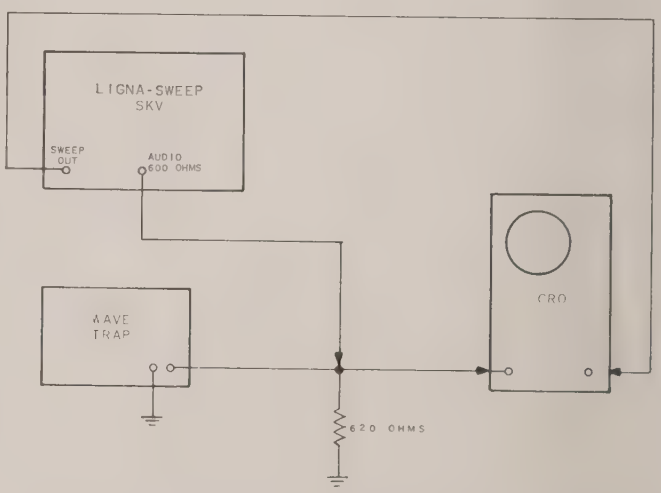


Fig. 6.4, Equipment Interconnections for Checking Audio Sweep. (A switching arrangement should be provided so that any one or combination of several wave traps can be used.)

Step 5. Waveform seen on the CRO should have equal amplitude on both negative and positive sides of zero-voltage baseline.

E. Frequency and Sweep Width of Narrow Variable Band.

Step 1. Interconnect equipment as shown in Fig. 6.4.

Step 2. Set panel controls as follows:

Sweep Selector: Nar Var
Band Selector: Nar Var & Video
AGC: Off
Log Sweep - Linear Sweep: Linear Sweep
Nar & Audio Centering: Mid-range
Rate Selector: Line Lock
Sweep Width: Maximum clockwise

Step 3. Set Center Frequency control to position zero beat at extreme left-hand side of trace.

Step 4. See that 20-kc mark produced by the wave trap is visible at right-hand side of trace.

F. Frequency and Sweep Width of Customer-Selected Bands.

Step 1. Interconnect equipment as shown in Fig. 6.3.

Step 2. Set panel controls as follows:

Rate Selector: Line Lock
Band Selector: Nar Var & Audio
AGC: Off
Nar & Audio Centering: Mid-range

Step 3. Set Sweep Selector to one of the customer-selected bands.

Step 4. Set output frequency of signal generator to center frequency of the band.

Step 5. See that marker produced by the signal generator is in approximate center of the trace.

Step 6. Tune output frequency of signal generator to place marker at left-hand side of trace.

Step 7. Tune output frequency of signal generator to place marker at extreme right-hand side of trace. The difference between readings obtained in Steps 6 and 7 is the sweep width of the band, and should be 20 kc.

G. Manual Sweep.

Step 1. Provide a connection between the Sweep Out terminal and horizontal input terminal of the CRO (CRO amplifiers should be set for d-c operation).

Step 2. Set Rate Selector to Line Lock.

Step 3. Note position and length of the horizontal trace.

Step 4. Set Rate Selector to Man.

Step 5. Rotate Man Sweep control and make certain that the trace covers at least the same distance and position as previously noted horizontal line.

H. Pip Output.

Step 1. Provide a connection between the Sweep Out terminal and the horizontal

input terminal of the CRO.

Step 2. Connect Pip Out terminal to vertical input terminal of CRO.

Step 3. Set panel controls as follows:

Sweep Selector: Wide Var
Rate Selector: Line Lock
Band Selector: Set to band on which pips are to appear.
Log Sweep - Linear Sweep: Linear Sweep
Sweep Width: Maximum clockwise
RF Level: Maximum clockwise
AGC: On
Attenuation: All out

Step 4. Set Pip Level control to mid-range.

Step 5. Turn Pip Adj control until a single, stable pip appears for each marker provided for the selected band.

I. Output Amplitude.

Step 1. Connect signal generator, set at 2 mc output, to input of detector box.

Step 2. Connect r-f voltmeter across input of detector box.

Step 3. Connect output of detector box to vertical input terminals of CRO.

Step 4. Connect Sweep Out terminals to horizontal input terminals of CRO.

Step 5. Set output amplitude of signal generator to give a reading of 1 volt on r-f voltmeter. Note vertical deflection.

Step 6. Disconnect signal generator and voltmeter from detector box.

Step 7. Connect RF Out jack to input of detector box.

Step 8. Check each band for 1 volt output. SKV should be set for maximum output amplitude.

6.4 ALIGNMENT PROCEDURE

This section includes instructions for aligning the SKV. If inspection indicates that one section of the instrument is malfunctioning, it is usually possible to repair and align that section only and ignore the remainder of the alignment procedure. However, if there is any doubt, the inspection procedure should be performed in its entirety.

Equipment Required

VTVM (RCA Sr. VoltOhmyst, or equivalent)
Cathode-ray Oscilloscope (Tektronix Type 503, or equivalent)
Detector (Fig. 6.1)
C-W Signal Generator (Kay Electric Utilator, or equivalent).
C-W Signal Generator (Tektronix Type 190, or equivalent).
Wide-Band R-F Voltmeter (Hewlett-Packard Type 400D, or equivalent).
Wave Traps tuned to 200, 2000, 10,000, and 20,000 cps.

A. Set Supply Voltages and Check Pilot Lamp Operation.

Step 1. Set On-Off switch to On. Dial lamps for Rate Selector and Sweep Selector should light.

Step 2. Set Sweep Selector to Wide Var & Video. Lamp for Band Selector should light.

Step 3. Set Sweep Selector to Nar Var. Band Selector lamp should remain lit and Var Swp indicator lamp should light.

Step 4. Set Sweep Selector to Audio. The Nar Swp indicator lamp should remain lit and Band Selector lamp should turn off.

Step 5. Connect VTVM between C-94 and chassis ground.

Step 6. Turn B+ Adj control (R-17, located in the power supply section) until VTVM indicates +250 volts.

Step 7. Connect VTVM between pin 5 of V-17 (located in power supply section) and chassis ground.

Step 8. Set Standby switch to On.

Step 9. See that VTVM indicates approximately +105 volts.

B. Set Sync Lock and Variable Repetition Rates.

Step 1. Provide a connection between the Sweep Out terminal and the vertical input terminal on CRO.

Step 2. Set CRO vertical amplifier for d-c operation.

Step 3. Set Rate Selector to Line Lock.

Step 4. Set CRO controls as follows:
Horiz. Display: Normal (int. sweep).
Trigger Selector: Auto, +INT.
Variable Time-Div: Calibrated, 5 milliseconds.

Step 5. Set Sweep Rate control to mid-range.

Step 6. Set 60 CPS Adj control (R-129) to mid-range.

Step 7. Adjust Sync Lock control R-9 until pattern locks in and sawtooth duration time is 16 ms. Fig. 6.2.

Step 8. Adjust 60 CPS Adj control until pattern remains locked at 16 ms throughout the range of Sweep Rate control.

Step 9. Set Rate Selector to Var 5-25.

Step 10. Set Sweep Rate control fully clockwise.

Step 11. See that the sawtooth duration time, as viewed on CRO, is less than 40 ms (indicating a repetition rate greater than 25 cps).

Step 12. Set Sweep Rate control fully counterclockwise.

Step 13. Set Variable Time/Div switch on CRO to 0.1 sec/div.

Step 14. See that sawtooth duration time is greater than 0.2 seconds (indicating a repetition rate less than 5 cps).

Step 15. Repeat Steps 9 through 14 for the 1 - 5 cps repetition rate and 0.2 - 1 cps repetition rate. The sweep duration times should be as follows: 5.0 = 0.2 seconds; 1.0 cps = 1.0 seconds; 0.2 cps = 5.0 seconds. Note:- Adjustment of repetition rates may be accomplished by changing values of C-56 for 5 - 25 cps range, C-57 for 1 - 5 cps range, and C-58 for 0.2 - 1 cps range. Increasing the value of these components will lower the repetition rate, decreasing the values increase the repetition rate.

Step 16. Set Rate Selector to Line Lock.

Step 17. Set Variable Time/DIV switch on CRO to 5 ms. Amplitude of straight portion of sawtooth should be 12 volts. Fig. 6.2.

C. Set R-F Variable Sweeping Oscillator (10 - 220 mc).

Check-out of Yoke Current

Step 1. Set panel controls as follows:

Sweep Selector: Wide Var & Video
Rate Selector: Line Lock
RF Level: Maximum clockwise
AGC: On
Sweep Width: Maximum clockwise
Log Sweep - Linear Sweep: Linear Sweep

Step 2. Interconnect equipment as in Fig. 6.5. CRO amplifiers should be set for d-c operation.

Step 3. Set Band Selector to 10 - 13.5 mc band.

Step 4. Place shorting buss across sweep width resistor R-38 and set Sweep Width control fully clockwise.

Step 5. Mark CRO screen at points indicating maximum horizontal deflection.

Step 6. Connect VTVM across R-66 (plate resistor of V-7).

Step 7. Set Rate Selector to Man Swp and adjust Manual Sweep control until spot on CRO coincides with the mark made on left side of CRO screen in Step 5.

Step 8. Adjust Yoke Current Adj control until VTVM indicates 0.3 volt (indicating a yoke current of 1 ma).

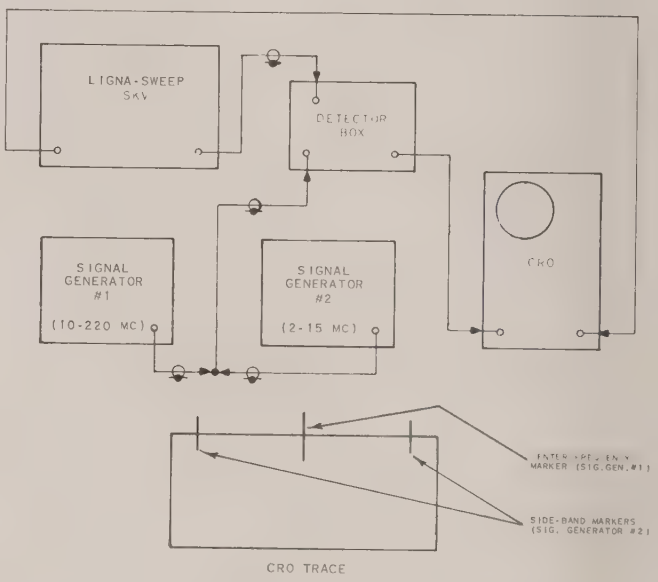


Fig. 6.5, Interconnection of Equipment for Alignment of R-F Bands.

Step 9. Remove shorting buss connected in Step 4.

Step 10. Adjust Manual Sweep control until spot coincides with mark on right side of screen. See that voltmeter shows a reading of approximately 7.0 volts (indicating a yoke current of approximately 22 ma).

Check-out of Center Frequencies

Step 1. Set Center Frequency dial to lowest reading on band being checked.

Step 2. Set signal generator #1 (10 - 220 mc) to reading shown on Center Frequency dial.

Step 3. Turn off signal generator #2 (2 - 15 mc).

Step 4. Turn Sweep Width control fully counterclockwise. The birdie produced by signal generator should appear on CRO screen.

Check-out of Sweep Widths

Step 1. Set Center Frequency dial to lowest specified frequency of band to be checked.

Step 2. Turn on signal generator #2.

Step 3. Set Sweep Width control fully clockwise.

Step 4. Sweep width should be approximately 60% of lowest specified frequency at frequencies below 50 mc, or 30 mc at frequencies above 50 mc. If sweep width differs from this value, select a new value for R-38. (Lowering value of the resistor increases sweep width). Note:- Sweep width should be measured with Center Frequency set to lower frequency limit of band. Sweep width is measured by setting birdie at extreme left-hand side of sweep. Record frequency of signal generator. Now tune signal generator until birdie appears at extreme right-hand side of trace. Difference between the two frequencies will give the sweep width. Sweep width resistors are represented by R-37 through R-48 on Schematic KD-6325-V. (Sweep widths for remaining bands should be checked after linearity checkout.)

Check-out of Linearity

Step 1. Interconnect equipment as in Fig. 6.5 and set output frequency of SKV to lowest specified frequency of band being checked.

Step 2. Set signal generator #1 so that center frequency birdie is positioned at center of trace. Frequency should be approximately equal to frequency indicated on the dial.

Step 3. Set signal generator #2 to produce sidebands spaced approximately one-half of the sweep width either side of center frequency.

Step 4. If sideband markers are not equi-distant from center marker, the value of linearity resistor R-49 must be selected to provide good linearity.

Check-out of Centering

Step 1. Turn off signal generator #2.

Step 2. Set Sweep Width control fully counterclockwise.

Step 3. Set signal generator to low end of band being checked.

Step 4. Vary Center Frequency control until birdie produced by the signal generator appears in center of trace.

Step 5. Turn Sweep Width control fully clockwise. The birdie should remain in approximate center of trace. If sweep center frequency does not remain centered while Sweep Width control is rotated, check Zener diode D-2.

Calibrate External Detector

Step 1. Set signal generator #2 at 2 mc and connect the output to the input terminals on detector box.

Step 2. Connect R-F voltmeter across signal generator output terminals.

Step 3. Adjust signal generator for 1 volt rms output.

Step 4. Connect output terminal of detector box to vertical input terminal of CRO.

Step 5. Set CRO for internal sweep, and adjust vertical gain controls to provide convenient trace amplitude. The detector has now been calibrated. Any signal of 1 volt rms amplitude applied to the detector input terminals will give this deflection on the CRO, providing that the CRO vertical gain controls are left at these settings.

Check-out and Adjustment of AGC

Step 1. Interconnect equipment as shown in Fig. 6.3, except the c-w signal gener-

ator is not required. (The detector should be calibrated for 1 volt.)

Step 2. With RF Level control fully clockwise, all attenuation out, and AGC switch set to AGC position, vary the AGC Max control until CRO indicates a vertical deflection corresponding to 1 volt input to detector.

Step 3. Switch in 3 db of attenuation and note vertical deflection.

Step 4. Switch out 3 db attenuation and turn RF Level control fully counterclockwise.

Step 5. Vary AGC Min control until vertical deflection is the same as that noted in Step 3.

Step 6. Repeat Steps 2 through 5 until no further adjustment is required. A 3-db swing of the RF Level control has now been established.

Step 7. See that the output is flat (±0.5 db) for maximum and minimum settings of RF Level and Sweep Width controls.

Center frequencies, sweep widths, linearity, centering, and agc of remainder of wide variable bands should now be checked out by methods similar to those indicated previously. Sweep width resistors are R-37 through R-48; linearity resistors are R-49 through R-50.

D. Check-out of Video Sweeps.

Step 1. Interconnect equipment as in Fig. 6.5.

Step 2. Set SKV panel controls as follows:

Sweep Selector: Wide Var & Video
Band Selector: Wide Video
Log Sweep - Linear Sweep: Linear Sweep
Rate Selector: Line Lock
Sweep Width: Set for about 10 mc width.
RF Level: Fully clockwise
AGC - Off: AGC
Attenuator: All out

Step 3. Connect VTVM between fixed crystal oscillator V-9 test point TP-2 and chassis ground.

Step 4. Adjust 30-mc trimmer C-63 for maximum negative reading on voltmeter. A reading of about -12 volts should be obtained.

Step 5. Set Center Frequency control for 12 mc.

Step 6. Set signal generator #1 for 12-mc output (turn off signal generator #2). A birdie marker should appear at approximate center of trace.

Step 7. Linearity should be checked as in Section 6.4C.

Step 8. By successive alternate adjustments of L-21, L-22, L-23, L-24, T-3, and T-4, obtain an output which is flat within ±0.5 db up to 13 mc.

Step 9. Provide a jumper-short between junction of C-44 and R-111, and chassis ground. Adjust modulator balancing potentiometer R-200 for a straight horizontal line (indicating zero voltage). The output at 15 mc should be down 20 db from the 1-volt level. If any output occurs above 15 mc, it may be minimized by adjusting modulator trimmer capacitor C-46.

Step 10. Reverse detector to compare positive and negative output. If both outputs correspond in amplitude and shape, the outputs are balanced.

Step 11. Set Band Selector to Nar Video and check the narrow video band in a similar

manner. Sweep width of the video bands should be adjusted on log sweep (covered in Section 6.4F).

Step 12. Set Rate Selector to Man Swp, turn Sweep Width control fully counterclockwise, and insert 6 db attenuation. Set output frequency controls to 0.2 mc.

Step 13. Connect RF Out jack directly to Y-input terminals of CRO, terminated with 70 ohms.

Step 14. Adjust sweep time of CRO until two complete cycles are displayed.

Step 15. Set AGC - Off switch to Off and see that output of SKV is a clean, undistorted sine wave over complete range of RF Level control. (Fuzzy appearance of the sine wave due to residual sweep should be ignored.)

Step 16. Repeat Step 15 with AGC - Off switch in AGC position.

If the sine wave is distorted, modulator input levels on video and audio bands should be checked. These may be checked with a VTVM fitted with an r-f probe. V-10 measurements are made at junction of C-44 and T-3. V-11 measurements are made at junction of C-53 and T-4. Approximate peak-to-peak values are given below:

SWEEP RANGE	V-10	V-11
AUDIO & NARROW VARIABLE	8.0V	11.2V
WIDE & NARROW VIDEO	6.0V	6.0V

Step 17. Repeat Step 15 with Band Selector set to Wide Video.

E. Check-out of Audio Sweep.

Step 1. Interconnect equipment as in Fig. 6.4.

Step 2. Set SKV controls as follows:

Rate Selector: 5-25
Sweep Rate: Approx. 10 cps
Sweep Selector: Audio
Band Selector: Nar Var & Audio
Sweep Width: Fully clockwise
RF Level: Fully clockwise
AGC: Off
Attenuator: All out
Log Sweep - Linear Sweep: Linear Sweep

Step 3. Leave RF Out jack open.

Step 4. Set Sweep Width control fully counterclockwise.

Step 5. Connect VTVM to fixed crystal oscillator V-9 test point TP-2.

Step 6. Adjust C-65 for maximum negative reading on VTVM (approx. -8 volts).

Step 7. Connect VTVM between narrow sweep oscillator V-8 test point TP-1 and ground.

Step 8. Tune L-19 for a maximum negative reading on VTVM (approx. -15 volts). Audio output should appear on CRO screen.

Step 9. Tune T-1 for maximum audio output.

Step 10. Tune L-19 and L-17 and adjust Nar & Audio Centering control until a sweep width from slightly below zero beat to slightly above 20 kc is obtained. A wave trap may be used to obtain the 20-kc "suckout".

Step 11. Peak the output amplitude by adjusting T-1.

Step 12. Insert a 10-kc wave trap and check linearity. See Fig. 6.6. Tuning L-17 will have some effect on linearity (slug should be kept near top of coil). Linearity resistor R-49 may have to be changed. Ascertain that Nar & Audio Centering control has sufficient range to allow observation of both the 20-kc mark and zero beat when sweep width is reduced to minimum.

Step 13. The 40-mc trap (L-25) should be tuned for maximum 40-mc signal rejection. This is accomplished by adjusting the slug for maximum audio output.

Step 14. Check output for 1 volt rms. Set Audio Level control R-163 to obtain 1 volt output.

Step 15. Check balance by making sure that audio sweep has equal output on positive and negative sides of zero voltage reference baseline (Fig. 6.6). If not, check video amplifier for clipping due to overload, or modulator for improper balance adjustment.

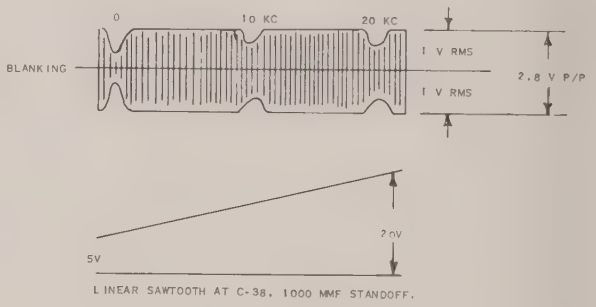


Fig. 6.6, Audio Response, Linear Sweep (line lock).

Step 16. Set Rate Selector to Man Swp and insert 6 db attenuation.

Step 17. Set sweep time of CRO at 1 ms/cm.

Step 18. Adjust Nar & Audio Centering control until three cycles are displayed on CRO.

Step 19. Check for clean undistorted sine wave over complete range of RF Level control.

F. Set the Logarithmic Sweep.

Step 1. Check logarithmic sweep on audio band. Use same control settings as for linear audio sweep, except that Log Sweep - Linear Sweep switch should be set to Log Sweep. Repetition rate should be set to about 5 cps. Switch the 200-, 2000-, and 20,000-cps wave traps into the circuit (Fig. 6.4). Turn Nar & Audio Centering control so that zero beat falls on left edge of trace. Adjust Sweep Width control so that 20-kc mark falls on right-hand edge of trace. If the trace does not divide into three equal segments (Fig. 6.7) (0 - 200 cps, 200 - 2000 cps, and 2000 - 20,000 cps), diodes D-3 through D-5 and associated circuitry should be checked.

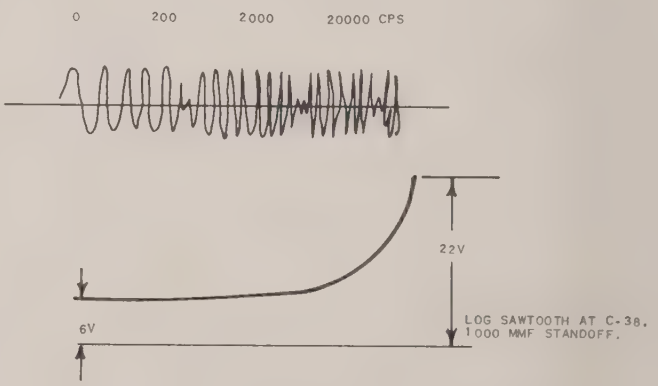


Fig. 6.7, Audio Response, Log Sweep. (5 cycle rep rate).

Step 2. Check logarithmic sweep on video band. Sweep width of wide and narrow video bands must be set on the logarithmic sweep. If necessary, choose proper resistor values (R-40 and R-41) to provide 12-mc and 1-mc width at the low ends respectively. These resistor values will give excess width on linear sweep.

G. Check-out of Narrow Variable Sweep.

Step 1. Interconnect equipment as in Fig. 6.3.

Step 2. Set panel controls as follows:

Sweep Selector: Nar Var
Band Selector: Nar Var & Audio

AGC: Off
Log Sweep - Linear Sweep: Linear Sweep
Nar & Audio Centering: Center of range
Rate Selector: Line Lock
Sweep Width: Fully clockwise
RF Level: Fully clockwise
Attenuator: All out

Step 3. Set Center Frequency control to zero. (When first turning to this band, several minutes should be allowed for the circuits to stabilize.)

Step 4. Connect input of detector box to RF Out jack and connect the output terminals of detector box to CRO vertical input terminals.

Step 5. Check sweep width and linearity by inserting a 10-kc wave trap. A "suck-out" should appear on each side of zero beat and at equal distances from it. Total sweep width should be 20 kc.

Step 6. Set tuning capacitor fully clockwise. Center frequency should be at least 2 mc.

Step 7. Check output for 1 volt rms.

Step 8. Set Rate Selector to Man Swp and insert 6 db attenuation. Set output frequency control to 0.1 mc.

Step 9. Using CRO internal sweep, adjust sweep time until several sine waves are observed.

Step 10. Note that the waveshape over complete range of RF Level control is undistorted.

Step 11. Repeat with AGC - Off switch set to AGC.

H. Check-out of Customer-Selected Bands.

Step 1. Interconnect equipment as in Fig. 6.3.

Step 2. Set panel controls as follows:

Rate Selector: Line Lock
Band Selector: Nar Var & Audio
AGC: Off
Nar & Audio Centering: Center of range
Log - Linear Sweep: Linear Sweep
Sweep Selector: One of customer-selected bands
Sweep Width: Fully clockwise
RF Level: Fully clockwise
Attenuator: All out

Step 3. Connect VTVM between TP-2 and ground.

Step 4. Tune oscillator trimmers C-66 through C-72 for maximum negative voltage.

Step 5. Check center frequency and sweep width.

Step 6. See that the output amplitude is at least 1 volt rms.

Note: The crystals used for these bands should be specified as follows:

Accuracy- 0.005%
Mode- 3rd
Cut- AT
Application- Series resonant
Case- Type HC-6

Customer-selected bands may be set for operation between 20 kc and 12 mc. When center frequency for the band has been selected, crystal frequency may be determined as follows:

$$f_c = 40mc - f_b$$

where, f_c = crystal frequency

f_b = center frequency of customer-selected band.

I. Check-out of Manual Sweep.

Step 1. Provide a connection between Sweep Out terminal and CRO horizontal input terminal.

Step 2. Set CRO horizontal amplifiers for d-c operation.

Step 3. Set Rate Selector to Line Lock and note position and length of horizontal trace.

Step 4. Set Rate Selector to Man Sweep.

Step 5. Rotate Man Sweep control and see that spot covers at least same distance and position as previously noted horizontal line.

J. Check-out of Fixed Markers.

Step 1. Provide a connection between Sweep Out terminal and CRO horizontal input terminal.

Step 2. Provide a connection between CRO vertical input terminal and pin 7 of V-201.

Step 3. Set panel controls as follows:

Rate Selector: Line Lock
Band Selector: Set to band on which pips should appear.
Sweep Selector: Set to band on which pips should appear.

On video bands, marker crystals are driven by r-f signal from buffer-amplifier V-204.

Step 4. Connect vertical input terminals of CRO through a capacitor (about .01uf) to pin 6 of Schmitt trigger V-202. A square pulse should be observed for each marker trigger pulse.

Step 5. Set external Pip Adj control R-218 to mid-range. Adjust internal Pip Adj control R-216 for one trigger for each active crystal in the circuit, according to setting of switches S-2 and S-3.

Step 6. Connect CRO vertical input terminals to Pip Out terminal on SKV.

Step 7. Adjust Pip Gen Adj control R-224 to give free-running operation ('picket-fence' pattern), then back away from this setting to one which gives stable, single pulses for each marker being used.

Step 8. Recheck adjustments for all rep rates (down to 5 cps for high-frequency sweep bands; down to 0.2 cps for video sweep bands).

K. Check-out of Variable Marker.

Step 1. Interconnect equipment as in Fig. 6.8.

Step 2. Set the output frequency of c-w signal generator to same frequency as SKV. A birdie marker should appear on the CRO screen.

Step 3. Vary frequency of c-w signal generator and see that marker travels across response curve. See that Var Mark Level control varies amplitude of marker.

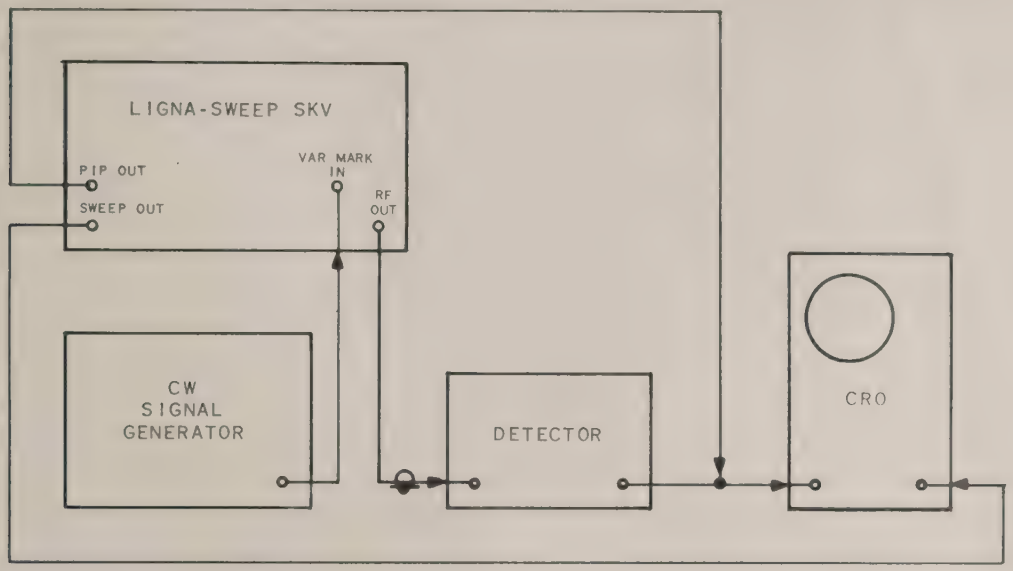


Fig. 6.8, Interconnection of Equipment for Checking Variable Marker.

SECTION VII, PARTS LISTS AND SCHEMATICS

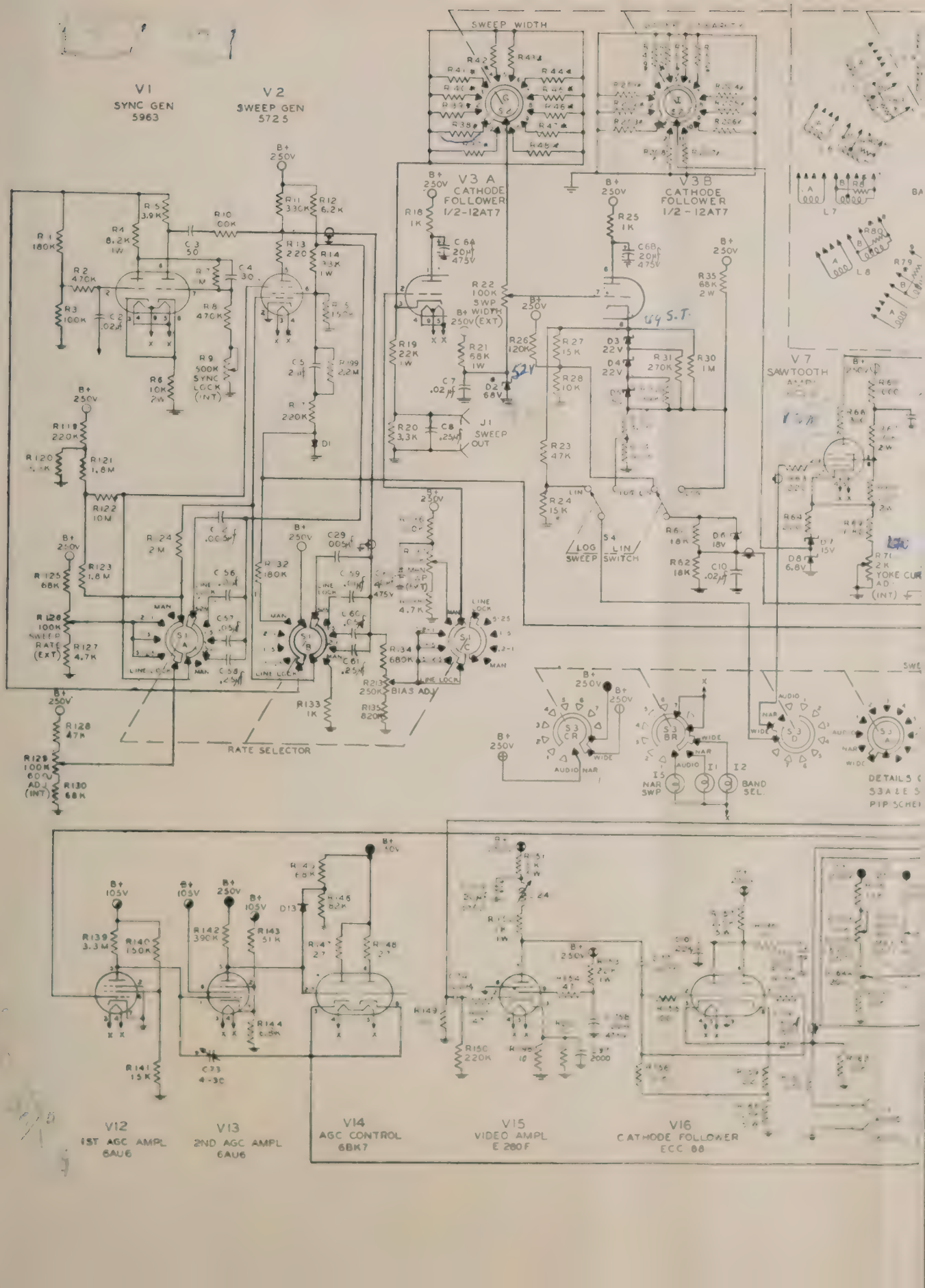
7.1 VARIABLE MARKER CIRCUIT (See pg. 3)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Capacitors: (All capacitances in uuf, 500 volts, unless otherwise indicated.)	
C601	390, silver mica	6359-65
C602	Not used	
C603	25uf, 25V, electrolytic	6355-4
C604	390, silver mica	6359-65
C605	25uf, 25V, electrolytic	6355-4
C606	1000, ceramic (tubular)	6361-25
C607	100, silver mica	6359-46
D601	Diode, germanium 1N294	6357-18
D602	Diode, germanium 1N294	6357-18
J601	Connector UG-625/U	451
	Resistors: (Unless otherwise indicated, all components are fixed composition, ½ watt, 10% tolerance resistors.)	
R601	500K, 2 watt pot, variable	126
R602	100	1011-E
R603	1K	1021-E
R604	100K	1041-E
R605	100K	1041-E
R606	Not used	
R607	100K	1041-E
R608	1K	1021-E
R609	47K	4731-E
R610	Not used	
R611	390	3911-E
R612	47K	4731-E
R613	300, 5% tolerance	3015-E
R614	1K	1021-E
R615	68	6801-E
R616	1K	1021-E
R617	1K	1021-E
R618	300, 5% tolerance	3015-E
R619	680	6811-E
V601	Tube, electron, 12AX7	12AX7

7-2 LIGNA-SWEEP SKV PARTS LIST (Schematic KD-6325-V)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Capacitors: (All capacitances in uuf, 500 volts, unless otherwise indicated.)	
C1	Not used	
C2	0.02uf, ceramic disc	6360-7
C3	50, silver mica	6359-60
C4	30, ceramic (tubular)	6361-12
C5	2uf, 300V, Mylar	6411-10
C6 A,B,C,D	4 x 20uf, 475V, electrolytic	6355-8
C7	0.02uf, ceramic disc	6360-7
C8	0.25uf, 400V, Mylar-paper	6899-3
C9	200, 1KV ceramic disc	6360-26
C10 & C11	0.02uf, ceramic disc	6360-7
C12	0.005uf, 600V, Mylar-paper	6899-17
C13 A & B	2 x 4-30, variable, air	6445
C14	10, ceramic (tubular)	6361-28
C15	1000, 75V, ceramic disc	6360-1
C16	4000, ceramic feed thru	6356-5
C17	1000, ceramic feed thru	6356-4
C18	10, ceramic (tubular)	6361-28
C19	1000, 75V, ceramic disc	6360-1
C20 thru C22	4000, ceramic feed thru	6356-5
C23	Not used	
C24 thru C26	0.01uf, ceramic disc	6360-6
C27	Not used	
C28	4000, ceramic feed thru	6356-5
C29	0.005uf, 600V, Mylar-paper	6899-17
C30	1000, ceramic feed thru	6356-4
C31	10, ceramic (tubular)	6361-28
C32	20, Varicap	6554
C33	500, 300V, silver mica	6359-66
C34	1000, ceramic feed thru	6356-4
C35	30, silver mica	6359-58
C36	100, silver mica	6359-7
C37	500, silver mica	6359-24
C38	1000, ceramic (tubular)	6361-25
C39 & C40	1000, ceramic feed thru	6356-4
C41	100, silver mica	6359-7
C42 & C43	1000, ceramic feed thru	6356-4
C44	500, silver mica	6359-24
C45	1000, ceramic (tubular)	6361-25
C46	1.5-7, ceramic trimmer	6358-4
C47	120, silver mica	6359-73
C48 & C49	250, silver mica	6359-75
C50	120, silver mica	6359-73
C51 & C52	1000, ceramic feed thru	6356-4
C53	500, silver mica	6359-24
C54	0.01uf, ceramic disc	6360-6
C55	390, silver mica	6359-19
C56	0.01uf, 400V, Mylar-paper	6899-8
C57	0.05uf, 400V, Mylar-paper	6899-6
C58	0.25uf, 400V, Mylar-paper	6899-3
C59	0.01uf, 400V, Mylar-paper	6899-8
C60	0.05uf, 400V, Mylar-paper	6899-6
C61	0.25uf, 400V, Mylar-paper	6899-3
C62	390, silver mica	6359-19
C63	7-45, ceramic trimmer	6358-7
C64	390, silver mica	6359-19
C65 thru C72	7-45, ceramic trimmer	6358-7
C73	4-30, ceramic trimmer	6358-6
C74	0.22uf, 50V, Mylar	6411-1
C75 A,B,C,D	4 x 20uf, 475V, electrolytic	6355-8
C76	200, ceramic disc	6360-26
C77	1.0uf, 300V, Mylar	6411-9
C78	0.002uf, ceramic disc	6360-24
C79	50uf, 150V, electrolytic	6355-25
C80 & C81	0.001uf, ceramic disc	6360-2
C82	1000, ceramic feed thru	6356-4
C83	0.001uf, ceramic disc	6360-2
C84 thru C87	Factory selected	
C88 thru C93	4000, ceramic feed thru	6356-5
C94	1000, ceramic feed thru	6356-4
C95 & C96	0.02uf, ceramic disc	6360-7
C97	150, silver mica	6359-62
C98	1000, ceramic feed thru	6356-4
C99	Not used	
C100	0.01uf, ceramic disc	6360-6
C101	0.02uf, ceramic disc	6360-7
D1	Silicon Rectifier, 1N538	6357-14
D2	Zener Diode, 3/4 M68Z10	6357-33
D3 & D4	" " 1N3028A	6357-35
D5	" " 1N1514	6357-11
D6	" " 3/4 M18Z10	6357-37
D7	" " 1N1514	6357-11
D8	" " 1N1510	6357-7
D9 thru D12	Silicon Rectifier G7C	6357-4
D13	" " 1N538	6357-14
D14 & D15	" " 1N82	6357-34
I1 thru I5	Light indicator, bayonet #44	249

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
J1	Binding post assembly	5371
J2	Connector, UG-625/U	451
J3	Binding post assembly	5371
J4	Connector, UG-185/U	204
L1 A & B	Coil, band, special	L1/6325V
L2 A & B	" " "	L2/6325V
L3 A & B	" " "	L3/6325V
L4 A & B	" " "	L4/6325V
L5 A & B	" " "	L5/6325V
L6 A & B	" " "	L6/6325V
L7 A & B	" " "	L7/6325V
L8 A & B	" " "	L8/6325V
L9 A & B	" " "	L9/6325V
L10 A & B	" " "	L10/6325V
L11 A & B	" " "	L11/6325V
L12 A & B	" " "	L12/6325V
L13	Reactor, saturable	4699
L14 & L15	Choke, filament 12uh	6394-1
L16	Not used	
L17	Coil, Crest #3	6836
L18	" special	L18/6325V
L19	" " slug-tuned	L19/6325V
L20	Not used	
L21	Coil, special, slug-tuned	L21/6325V
L22	" " "	L22/6325V
L23	" " "	L23/6325V
L24	" " "	L24/6325V
L25	" " "	L25/6325V
P1	Plug, male, P-308-CCT	453
	Resistors: (Unless otherwise specified, all components are fixed composition, ½ watt, 10% tolerance resistors.)	
R1	180K	1841-E
R2	470K	4741-E
R3	100K	1041-E
R4	8.2K, 1 watt	8221-G
R5	7.9K	3921-E
R6	10K, 2 watt	1031-H
R7	1 Meg.	1051-E
R8	470K	4741-E
R9	500K, 2 watt pot, variable	126
R10	100K	1041-E
R11	330K	3341-E
R12	6.2K, 5% tolerance	6225-E
R13	220	2211-E
R14	33K, 1 watt	3331-G
R15	150K	1541-E
R16	Not used	
R17	220K	2241-E
R18	1K	1021-E
R19	22K, 1 watt	2231-G
R20	3.3K	3321-E
R21	68K, 1 watt	6831-G
R22	100K, 2 watt pot, variable	121
R23	47K	4731-E
R24	Factory selected	
R25	1K	1021-E
R26	120K	1241-E
R27	15K	1531-E
R28	10K	1031-E
R29	Not used	
R30	1M	1051-E
R31	270K	2741-E
R32	39K	3931-E
R33	3.3K	3321-E
R34	4.7K	4721-E
R35	68K, 2 watt	6831-H
R36	Not used	
R37 thru R52	Factory selected	
R53	100K, ¼ watt	1041-C
R54	100K	1041-E
R55	33K	3331-E
R56	15K	1531-E
R57 thru R59	Not used	
R60	1K	1021-E
R61 & R62	18K	1831-E
R63 & R64	220	2211-E
R65	Not used	
R66	300, 5% tolerance	3015-E
R67	10K, 2 watt	1031-H
R68	22K, 2 watt	2231-H
R69	680	6811-E
R70	2K, 2 watt pot, variable	105
R71	15K, ¼ watt	1531-C
R72	33K	3331-E
R74	100K, ¼ watt	1041-C
R75 thru R86	Factory Selected	
R87	56K, 1 watt	5631-G
R88 & R89	300, ¼ watt, 5% tolerance	3015-C


V1
SYNC GEN
5963
V2
SWEEP GEN
5725
SWEEP WIDTH
V3 A
CATHODE
FOLLOWER
1/2-12AT7
V3 B
CATHODE
FOLLOWER
1/2-12AT7
V7
SAWTOOTH
AMP
B+
250V
R1 180K
R2 470K
R3 100K
R4 8.2K 1W
R5 3.9K
R6 10K 2W
R7 1M
R8 470K
R9 500K SYNC LOCK (INT)
R10 68K
R11 330K
R12 6.2K
R13 220
R14 33K 1W
R15 15K
R199 2.2M
R16 220K
D1
C1 .02
C2 .02
C3 50
C4 30
C5 2
C6 .02
C7 .02
C8 .25
C64 20 475V
C68 20 475V
R18 1K
R19 22K 1W
R20 3.3K
R21 68K 1W
R22 100K SWP WIDTH 250V(EXT)
R23 47K
R24 15K
R25 1K
R26 120K
R27 15K
R28 10K
R30 1M
R31 270K
R35 68K 2W
D2 68V
D3 22V
D4 22V
J1 SWEEP OUT
S4 LIN/LOG SWEEP SWITCH
R62 18K
R63 18K
D6 18V
D7 15V
D8 6.8V
C10 .02
R64
R66
R67
R68
R69
R71 2K YOKE CUR ADJ (INT)
R118 220K
R120
R121 1.8M
R122 10M
R123 1.8M
R124 2M
R125 68K
R126 100K SWEEP RATE (EXT)
R127 4.7K
R128 47K
R129 100K 60% ADJ (INT)
R130 68K
R132 180K
R133 1K
R134 680K
R135 820K
R213 250K BIAS ADJ
C29 .005
C56
C57 .05
C58 .25
C59
C60 .05
C61 .25
4.7K
S1 A
S1 B
S1 C
MAN
LINE LOCK
RATE SELECTOR
S3 CR
S3 BR
S3 D
S3 A
WIDE
NAR
AUDIO
I1
I2
I5
NAR SWP
BAND SEL.
DETAILS OF S3 A,B,C,D PIP SCHEM
105V
R139 3.3M
R140 150K
R141 15K
R142 390K
R143 51K
R144
R145 82K
R146 82K
R147 27
R148 27
D13
C73 4-30
R149
R150 220K
R151 1K 1W
R152 2.2K 1W
R153 47K
R154 47K
R155 2.2K 1W
R156 47K
R157 10
C150 .005 2000
V12
1ST AGC AMPL
6AU6
V13
2ND AGC AMPL
6AU6
V14
AGC CONTROL
6BK7
V15
VIDEO AMPL
E 280F
V16
CATHODE FOLLOWER
ECC 88

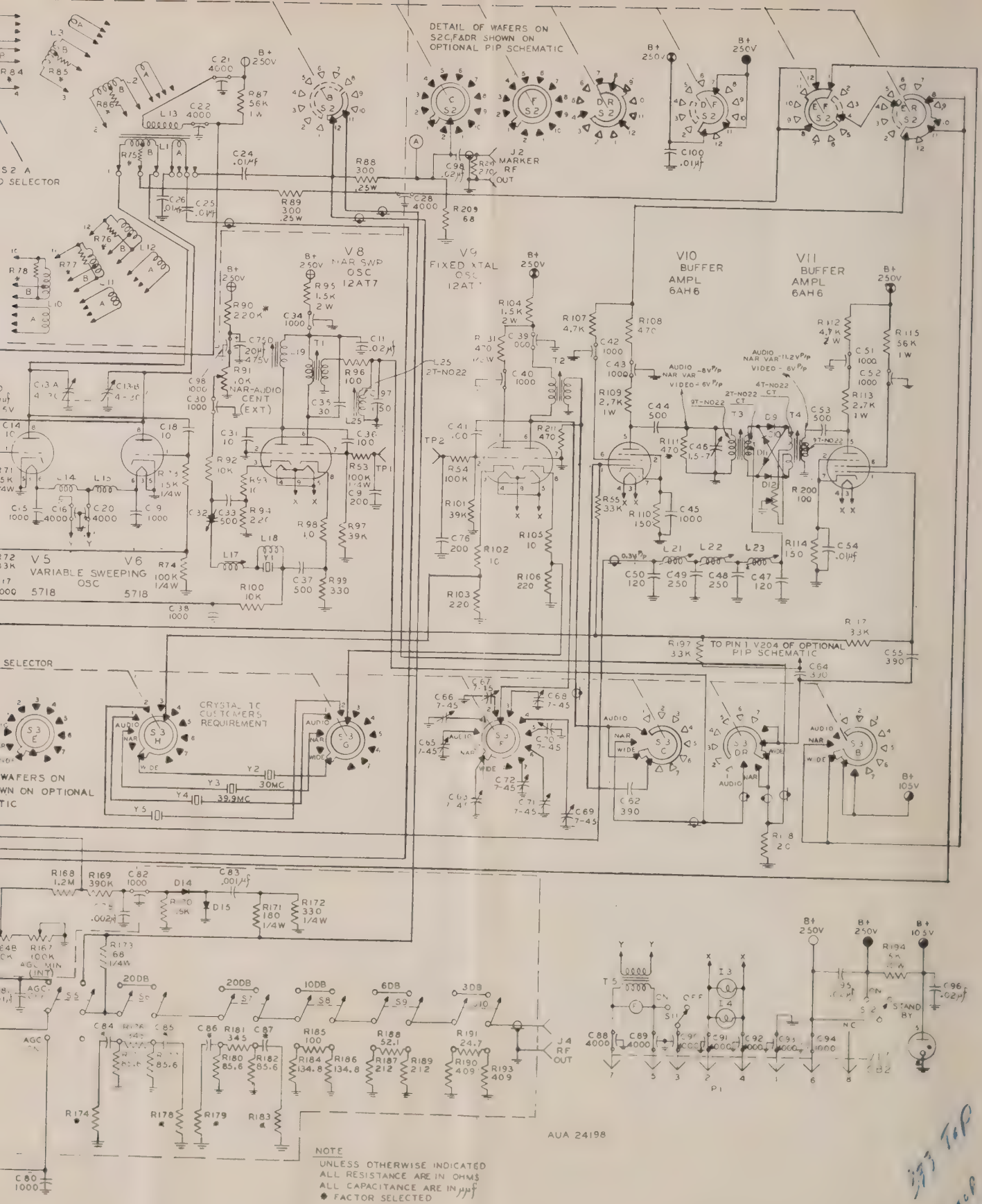


Fig. 7.1 LIGNA-SWEEP SKV, KD-6325-V

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
R90	Factory selected	
R91	10K, 2 watt pot, variable	108
R92	10K	1031-E
R93	10	1001-E
R94	220	2211-E
R95	1.5K, 2 watt	1521-H
R96	100	1011-E
R97	39K	3931-E
R98	10	1001-E
R99	330	3311-E
R100	100K, ¼ watt	1041-C
R101	39K	3931-E
R102	10	1001-E
R103	220	2211-E
R104	1.5K, 2 watt	1521-H
R105	10	1001-E
R106	220	2211-E
R107	4.7K	4721-E
R108	470	4711-E
R109	2.7K, 1 watt	2721-G
R110	150	1511-E
R111	Factory selected	
R112	4.7K, 2 watt	4721-H
R113	2.7K, 1 watt	2721-G
R114	150	1511-E
R115	56K, 1 watt	5631-G
R116 & R117	33K	3331-E
R118	120	1211-E
R119	220K	2241-E
R120	3.3K	3321-E
R121	1.8M	1851-E
R122	10M	1061-E
R123	1.8M	1851-E
R124	2M	2051-E
R125	68K	6831-E
R126	100K, 2 watt pot, variable	121
R127	4.7K	4721-E
R128	47K	4731-E
R129	100K, 2 watt pot, variable	121
R130	68K	6831-E
R131	470, ¼ watt	4711-C
R132	180K	1841-E
R133	1K	1021-E
R134	680K	6841-E
R135	820K	8241-E
R136	100K	1041-E
R137	100K, 2 watt pot, variable	121
R138	4.7K	4721-E
R139	3.3M	3351-E
R140	150K	1541-E
R141	15K	1531-E
R142	390K	3941-E
R143	51K, 5% tolerance	5135-E
R144	6.8K	6821-E
R145	68K	6831-E
R146	82K	8231-E
R147 & R148	27	2701-E
R149	100	1011-E
R150	220K	2241-E
R151	5K, 5 watt, wirewound	5021-J
R152	1K, 1 watt	1021-G
R153	22K, 1 watt	2231-G
R154	47	4701-E
R155	100	1011-E
R156	10K	1031-E
R157	2.5, 5 watt	2521-J
R158	100	1011-E
R159	22	2201-E
R160	1.5K, 5 watt	1521-J
R161	560, 5% tolerance	5615-E
R162	10K	1031-E
R163	10K, 2 watt pot, variable	108
R164 A & B	20K/50K, 2 watt, dual pot	6449
R165	100K	1041-E
R166	500K, 2 watt pot, variable	126
R167	100K, 2 watt pot, variable	121
R168	1.2M	1251-E
R169	390K	3941-E
R170	15K	1531-E

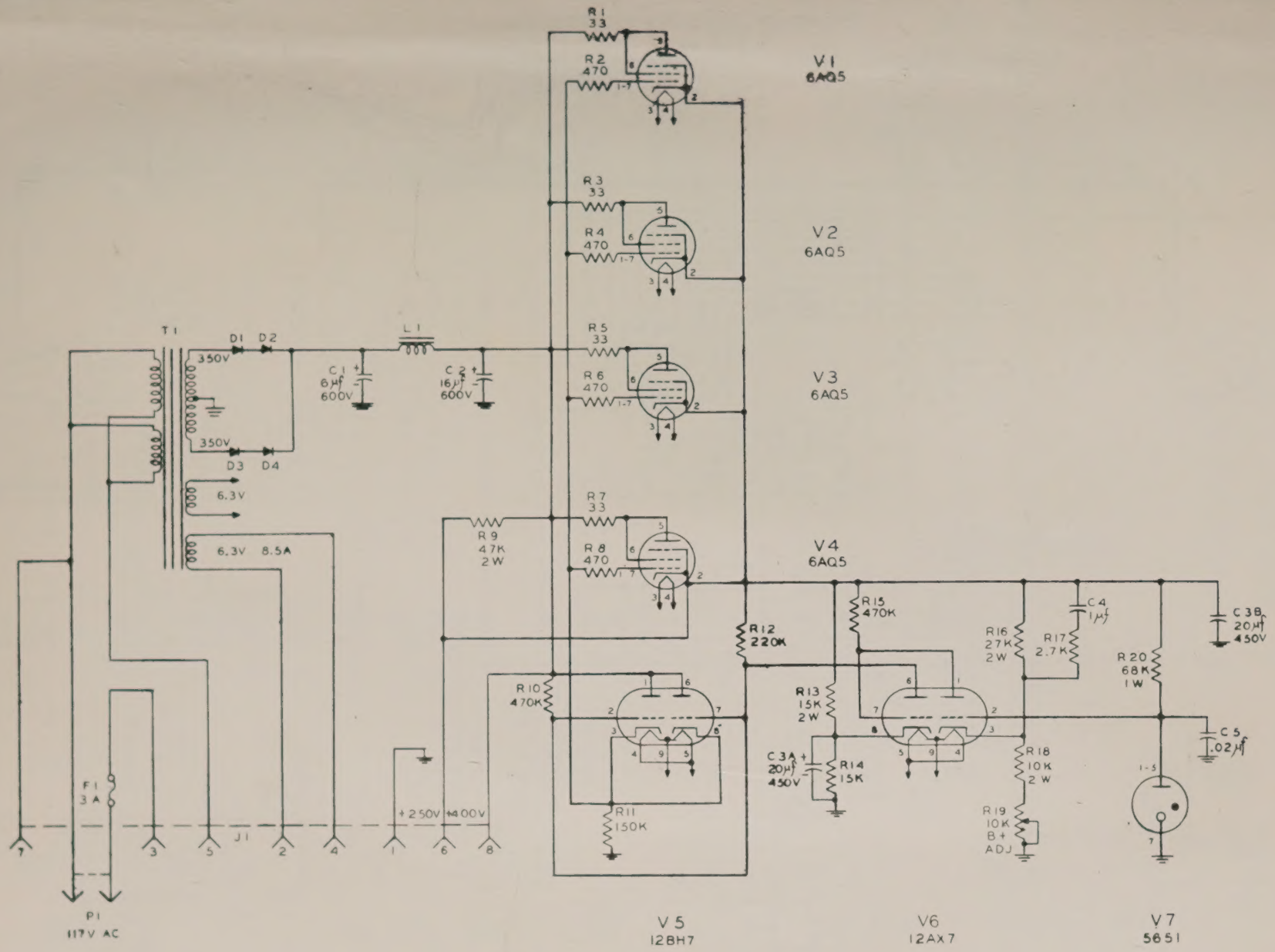
DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
R171	180, ¼ watt	1811-C
R172	330, ¼ watt	3311-C
R173	68, ¼ watt	6801-C
R174	Factory selected	
R175	85.6, ¼ watt, 1% tolerance	6558-25
R176	345, ¼ watt, 1% tolerance	6558-41
R177	85.6, ¼ watt, 1% tolerance	6558-25
R178 & R179	Factory selected	
R180	85.6, ¼ watt, 1% tolerance	6558-25
R181	345, ¼ watt, 1% tolerance	6558-41
R182	85.6, ¼ watt, 1% tolerance	6558-25
R183	Factory selected	
R184	134.8, ¼ watt, 1% tolerance	6558-31
R185	100, ¼ watt, 1% tolerance	6558-26
R186	134.8, ¼ watt, 1% tolerance	6558-31
R187	212, ¼ watt, 1% tolerance	6558-35
R188	52.1, ¼ watt, 1% tolerance	6558-18
R189	212, ¼ watt, 1% tolerance	6558-35
R190	409, ¼ watt, 1% tolerance	6558-42
R191	24.7, ¼ watt, 1% tolerance	6558-13
R192	Not used	
R193	409, ¼ watt, 1% tolerance	6558-42
R194	5K, 10 watt	5021-K
R195	47	4701-E
R196	10	1001-E
R197	33K	3331-E
R198	10	1001-E
R199	2.2M	2251-E
R200	100, ½ watt pot, variable	7240
R201 thru R208	Factory selected	
R209	68	6801-E
R210	270	2711-E
R211	470	4711-E
R212	10	1001-E
R213	250K, 2 watt pot, variable	123
	Switches:	
S1	Rotary, 4 wafers, 5 position	6552
S2	" band, 12 position	6437
S3	" 8 wafer, 10 position	6441
S4	Toggle, DPDT	254-A
S5	" "	254-TX
S6 thru S10	" "	254-T
S11 & S12	" SPST	255-A
	Transformers:	
T1	Special slug-tuned	T1/6325V
T2	" "	T2/6325V
T3	" "	T3/6325V
T4	" "	T4/6325V
T5	Filament	30149
	Electron Tubes:	
V1	5963	5963
V2	5725	5725
V3	12AT7	12AT7
V4	Not used	
V5 & V6	5718	5718
V7	6CL6	6CL6
V8 & V9	12AT7	12AT7
V10 & V11	6AH6	6AH6
V12 & V13	6AU6	6AU6
V14	6BK7	6BK7
V15	E280F	E280F
V16	ECC88	ECC88
V17	OB2	OB2
	Crystals:	
Y1	13.328 mc	Y1/13.328MC
Y2	30.0 mc	Y2/30.0MC
Y3	39.9 mc	Y3/39.9MC
Note:	(All other crystals are determined by customers marker requirements.)	
	Attenuator, complete	6436
	Fan, (less shields)	7340

7.3 POWER SUPPLY PARTS LISTS(KC-7206-B)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Capacitors:	
C1	6uf, 600V, electrolytic	1532
C2	16uf, 600V, electrolytic	6355-57
C3 A & B	20/20uf, 450V, electrolytic	6355-10
C4	1.0uf, 300V, Mylar	6411-9
C5	0.02uf, 500V, ceramic disc	6360-7
D1 thru D4	Silicon rectifier F6	6357-3
F1	Fuse, 3 amp 250V	245
J1	Socket, female, S-308-AB	401
L1	Choke, 8 henry	6394-8
P1	AC line cord (3 wire)	7166
	Resistors: (Unless otherwise specified, all components are fixed composition, ½ watt, 10% tolerance resistors.)	
R1	33	3301-E
R2	470	4711-E
R3	33	3301-E
R4	470	4711-E
R5	33	3301-E
R6	470	4711-E
R7	33	3301-E
R8	470	4711-E
R9	47K, 2 watt	4731-H
R10	470K	4741-E
R11	150K, 1 watt	1541-G
R12	220K	2241-E
R13 & R14	15K, 2 watt	1531-H
R15	470K	4741-E
R16	27K, 2 watt	2731-H
R17	2.7K	2721-E
R18	10K, 2 watt	1031-H
R19	10K, 2 watt pot, variable	109
R20	68K, 1 watt	6831-G
T1	Transformer, power	6877
	Electron Tubes:	
V1 thru V4	6AQ5	6AQ5
V5	12BH7	12BH7
V6	12AX7	12AX7
V7	5651	5651

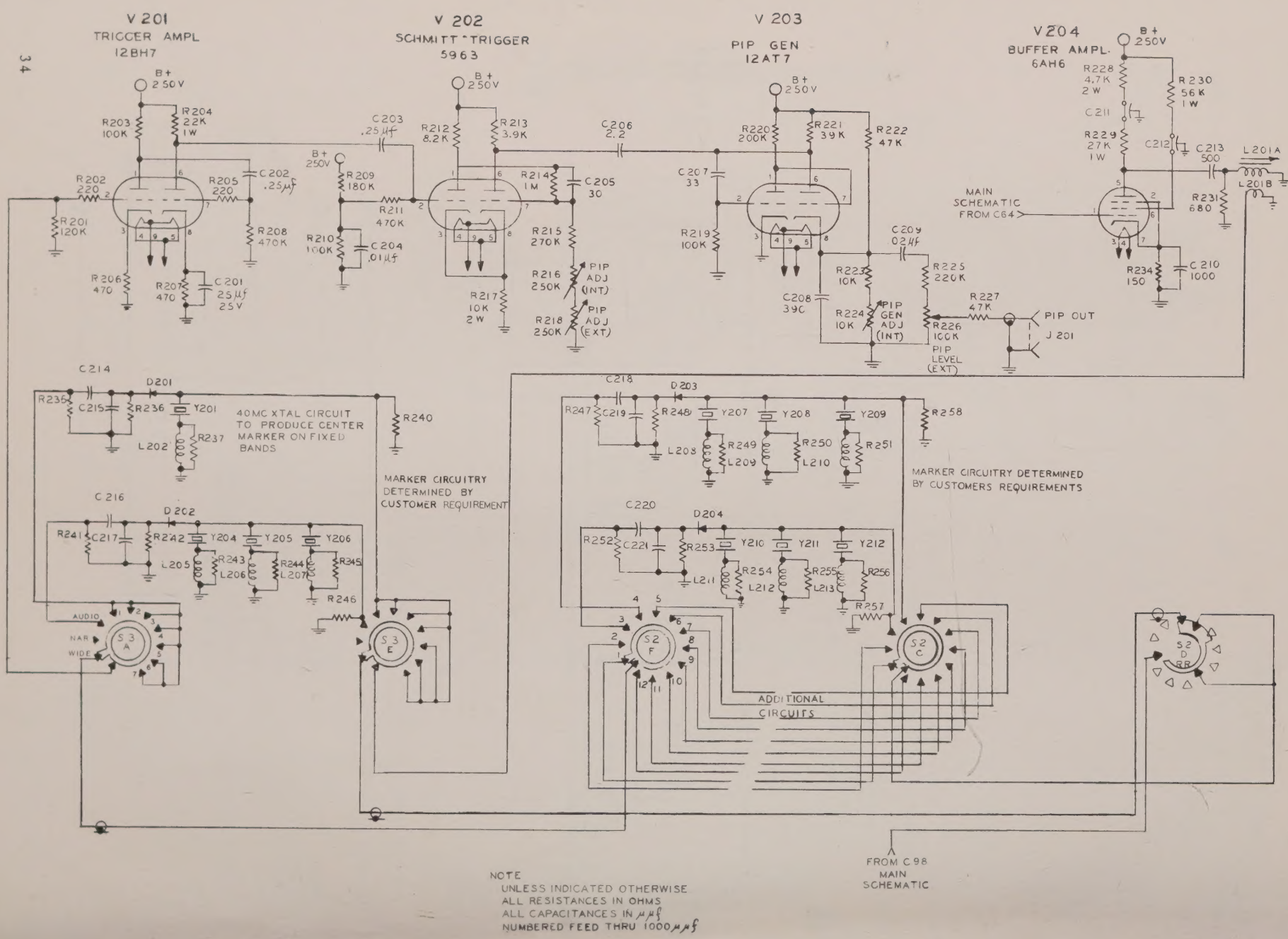
7.4 OPTIONAL PIP CIRCUIT PARTS LIST (KC-6316-G)

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Capacitors: (All capacitances in uuf, 500 volts, unless otherwise indicated.)	
C201	25uf, 25V, electrolytic	6355-4
C202 & C203	0.25uf, 400V, Mylar-paper	6899-3
C204	0.01uf, ceramic disc	6360-6
C205	30, Ceramic (tubular)	6361-12
C206	2.2, ceramic (tubular)	6361-3
C207	33, ceramic (tubular)	6361-13
C208	390, silver mica	6359-20
C209	0.02uf, Ceramic disc	6360-7
C210	1000, ceramic (tubular)	6361-25
C211 & C212	1000, ceramic feed thru	6356-4
C213	500, silver mica	6359-24
Note: (All capacitors after C213 and all diodes are selected depending on customer marker requirement.)		
J201	Connector, UG-625/U	451
L201 A & B	Coil, special slug-tuned	L201/6316G
Note: (All coils after L201 are selected depending on customer marker requirement.)		
	Resistors: (Unless otherwise specified, all components are fixed composition, ½ watt, 10% tolerance resistors.)	
R201	120K	1241-E
R202	220	2211-E
R203	100K	1041-E
R204	22K, 1 watt	2231-G
R205	220	2211-E
R206 & R207	470	4711-E
R208	100K	1041-E
R209	180K	1841-E
R210	100K	1041-E
R211	470K	4741-E
R212	8.2K, 1 watt	8221-G
R213	3.9K	3921-E
R214	1 M	1051-E
R215	270K	2741-E
R216	250K, 2 watt pot, variable	123
R217	10K, 2 watt	1031-H
R218	250K, 2 watt pot, variable	123
R219	100K	1041-E
R220	200K, 5% tolerance	2045-E
R221	39K	3931-E
R222	47K	4731-E
R223	10K	1031-E
R224	10K, 2 watt pot, variable	108
R225	220K	2241-E
R226	100K, 2 watt pot, variable	121
R227	47K	4731-E
R228	4.7K, 2 watt	4721-H
R229	27K, 1 watt	2731-G
R230	56K, 1 watt	5631-G
R231	680	6811-E
R232 & R233	Not used	
R234	150	1511-E
Note: (All resistors after R234 are selected depending on customer marker requirement.)		
S2 & S3	See main parts list Dwg. No. KD-6325-V	
	Electron Tubes:	
V201	12BH7	12BH7
V202	5963	5963
V203	12AT7	12AT7
V204	6AH6	6AH6
	Crystal, quartz	
Note: (Crystal frequencies are determined by customer marker requirements.)		



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS
ALL CAPACITANCES ARE IN µµf

Fig. 7.2 POWER SUPPLY, KC-7206-B



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES IN OHMS
ALL CAPACITANCES IN µµf
NUMBERED FEED THRU 1000µµf

Fig. 7.3 OPTIONAL PIP CIRCUITS, KC-6316-G

TEAR OFF AT THIS LINE

We would like to maintain contact with the people who use or fix our instruments. Would you please complete the following and return to us–

9358

Your Name.....

Company .....

Div. or Dept. .....

Street .....

City, Zone, State .....

Telephone No. .....

Do you use this instrument? ..... ☐

Maintain or repair it? ..... ☐

Should we be doing something to help you?.....

.....

.....

Send extra manual on Model..... .

Send general data..... ☐

92332